CHNOLOGY DEPT.

The Chemical Age

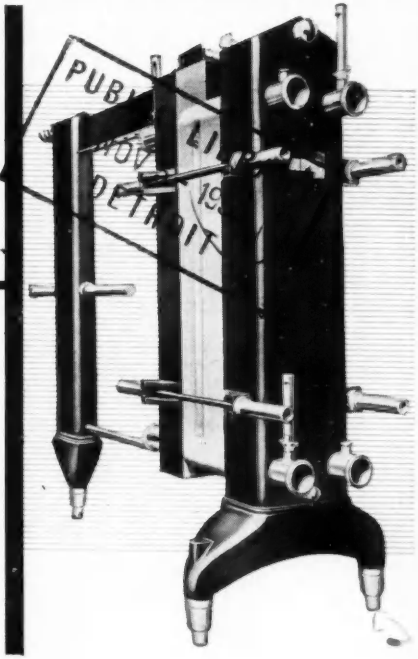
L LXIX 24 OCTOBER 1953 No 1789

12 Points of the
APV PARAFLOW
THAT MAY HOLD THE ANSWER TO YOUR HEAT EXCHANGE PROBLEM

APV Paraflow Plate-Type Heat Exchanger sesses a combination of features that is proving answer to many difficult problems.

1 **High rate of heat transfer.**
2 **Full accessibility of liquid-bearing surfaces.**
3 **Small temperature differences and fine limits of temperature control.**
4 **Small liquid hold-up.**
5 **Greater freedom from danger of mixing.**
6 **Visibility of any leakage.**
7 **Small space requirements.**
8 **Standardisation of components.**
9 **Wide range of rates and pressures.**
10 **Ease of extension or modification.**
11 **Ability to perform multi-stage or alternative duties in the same machine.**
12 **Alternative materials of construction enabling corrosive conditions to be countered.**

ss your heat exchanger problems to the APV emical Engineering Department who will advise u without obligation.



APV
Chemical Engineers
THE A.P.V. CO. LTD.
WANDSWORTH PARK, LONDON, S.W.18
Telephone: VANDYKE 4492 (11 lines)
ASSOCIATED MANUFACTURING COMPANIES IN INDIA AND AUSTRALIA

"REDAC" PRODUCTS

"HUNCOAT REDAC"

ACID RESISTING EARTHENWARE

ACID RESISTING TILES · BRICKS
ACID TOWER PACKINGS
RINGS AND BALLS

Successfully used in
GAILLARD TOWERS · ACID OIL SETTLING TANKS
GAS WASHERS · CHIMNEY LININGS · ASH SLUICES
HYDROCHLORIC PICKLING TANKS, ETC.

PRACTICALLY INDESTRUCTIBLE, CHEAPER & SUPERIOR TO LEAD AND OTHER MATERIALS

Enquiries Welcomed

B. WHITAKER & SONS, LTD.

ST. STEPHENS HOUSE, WESTMINSTER

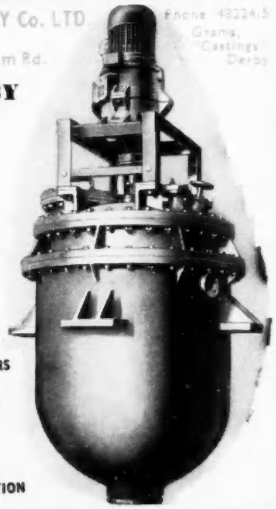
Phone: Whitehall 3616 Works: ACCRINGTON, LANCS. Grams: Bricavity, Parl, London

BROWNS

FOUNDRY Co. LTD.
Nottingham Rd.
DERBY
Est. 1868

Phone 43224/5
Grams "Castings" Derby

CHEMICAL PLANT TO SUIT CUSTOMERS DESIGNS AND SPECIFICATION



Phthalic Anhydride
Butanol
Butyl Acetate
Di-ethyl Phthalate
Di-butyl Phthalate
Di-octyl Phthalate
Di-octyl Adipate

Available for prompt shipment

G I SERVICE

A Harris & Dixon Company

Guest Industrials Ltd.

Raw Materials Division

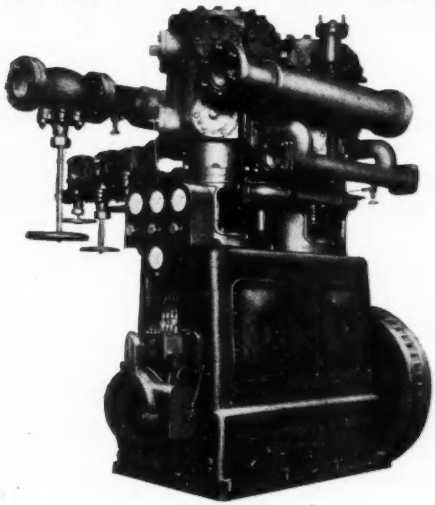
81, Gracechurch Street, London, E.C.3
Telephone: Mansion House 5631 (16 lines)
Telegrams: Guestind, London

BROTHERHOOD

Air, Gas and Refrigerating **Compressors**

For the manufacture of

ARTIFICIAL FERTILISERS and other **CHEMICALS**



Also

STEAM TURBINES

STEAM ENGINES

GENERATING SETS

Literature describing Brotherhood Products available on request

PETER BROTHERHOOD

PETERBOROUGH ENGLAND

COMPRESSOR & POWER PLANT SPECIALISTS FOR NEARLY A CENTURY

A

WILKINSON PRODUCT MAKING RUBBER SERVE INDUSTRY

...BIG ENOUGH TO HOLD STONEHENGE

120′ diam. Dorr Thickener Linatex lined for long life!

This 120′ diameter Dorr Thickener on the Continent has been lined with 20,000 square feet of Linatex. Once again a great modern project has called in this wonderful material to solve the ever-present problems of abrasion and corrosion — for the resistant properties of Linatex to these twin menaces are supreme. Whatever the purpose of tank or pipe, whether it is for storing or conveying acids, sea-water, gases, grit, gravel, rock, grain, etc. Linatex will add years to its normal life. Linatex linings are economical, too, and conversion of existing plant can, if necessary, be carried out on site. If you have a problem of this sort, our Resident Engineer in your district will be pleased to call on you.

LINATEX 95% pure NATURAL RUBBER

Linatex is 95% pure natural rubber . . . *with a strength and resilience that has proved in countless industrial applications. Made entirely without heat or mastication it retains permanently the natural cell-structure of the living rubber. Temperature extremes of −60°C to +66°C are withstood by Linatex. It can be permanently cemented to itself and other surfaces.*

for tank and pipe linings

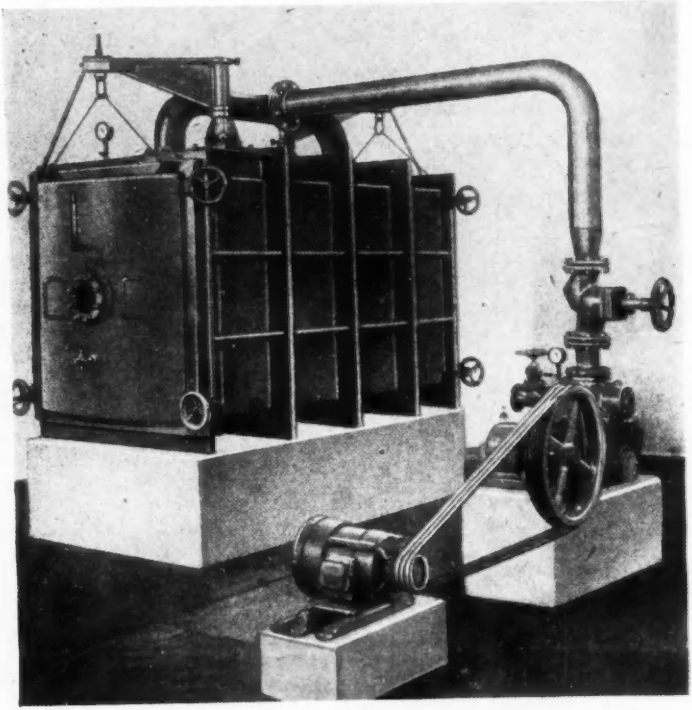
WILKINSON RUBBER LINATEX LTD., Camberley, Surrey. (Tel: Camberley 1595)
Factories and Distributors throughout the world.

LI2

VACUUM DRYING CABINETS

ex-stock, for the

CHEMICAL FOOD & ALLIED INDUSTRIES



THE ABOVE ILLUSTRATION IS AN ACCURATE REPRODUCTION OF THESE VACUUM DRYING CABINETS AND DEPICTS CHAMBER COMPLETE WITH ALL ANCILLARIES AND ACCESSORIES WHICH ARE INCLUDED FOR THE LAYOUT AS ILLUSTRATED.

* * *

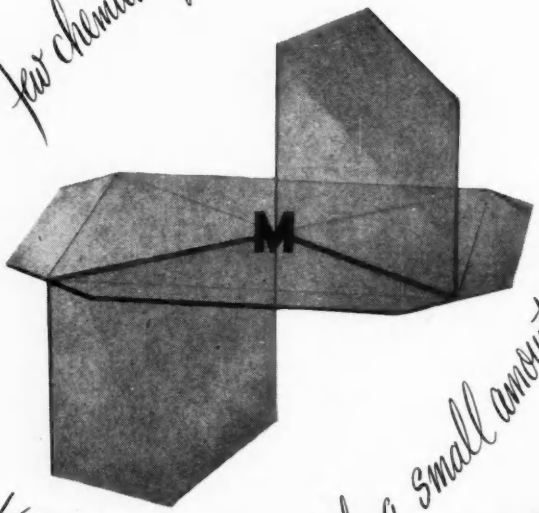
ALSO EX STOCK RANGE OF VACUUM HORIZONTAL AND VERTICAL WET AND DRY AIR PUMPS.

CIVITAS TRADING CORPORATION LTD.

WIGMORE HOUSE · 10 DUKE STREET · LONDON · W1

Telephone: WELbeck 6690. Cables: CIVITAS, LONDON.

Few chemical processes are immune from those vexing metal effects which a small amount of Sequestrol may prevent



SEQUESTROL

ethylene diamine tetra-acetic acid (Geigy)

This powerful organic complexing agent is widely used in most diverse processes throughout industry: clarifying, cleansing, stabilising, dyeing, scouring, soap manufacture, hard water treatment, hard water estimation and other analytical processes, rubber proofing of textiles, production of surgical catgut, photography, paint removal, electrical industries and electrolitic processes, etc.

THE GEIGY COMPANY LTD. Rhodes, Middleton, MANCHESTER

Geigy the original producers of sequestering agents in this country

E.11

'PYREX' Reg'd. Trade Mark BRAND
Visible Flow
PIPE LINES

A Glass SINK TRAP

that revolutionizes the disposal of waste liquids

(patent applied for)

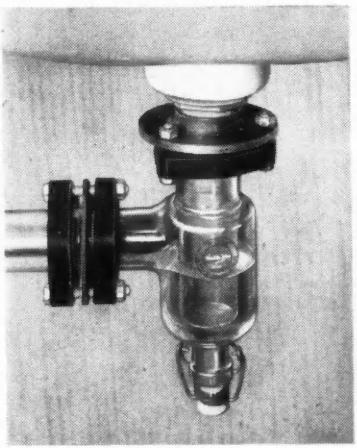
ONE glance at this new Sink trap, made in 'PYREX' *Visible Flow* Glass, will demonstrate its value to Industry and Science. It finds a ready place in the Factory, the Laboratory, the Hospital, the School, and finally in the home.

In conjunction with 'PYREX' *Visible Flow* Waste Pipes, this new trap is particularly useful where chemica's have to be disposed of. Any trapped residue can be seen at a glance and released by the pressure of the thumbs.

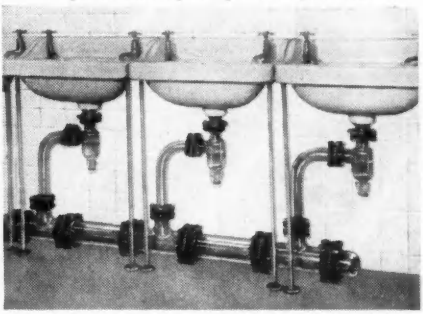
The six main features are :

1. Visibility.
2. Chemical Stability.
3. No metal in contact with liquid.
4. No tools required when cleaning trap.
5. No detachable parts to get lost.
6. No threads to burr up when cleaning.

Let us send you full particulars, or better still, a specimen trap for your inspection.



The new Sink Trap Unit showing construction.

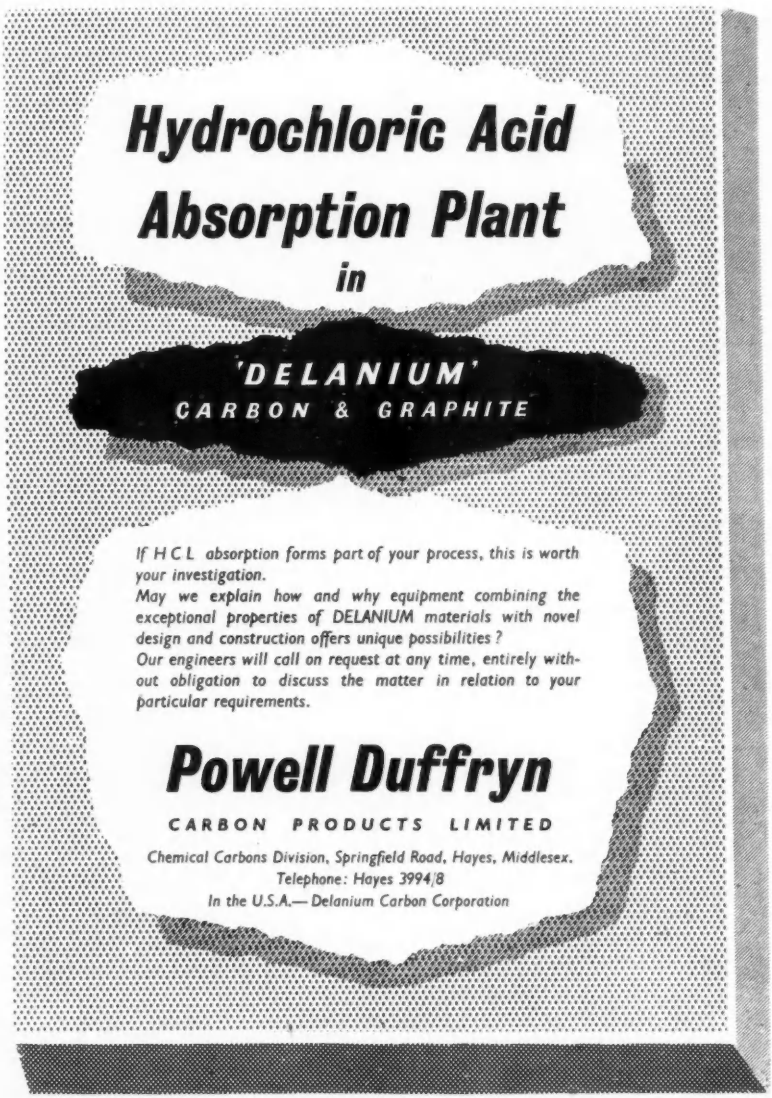


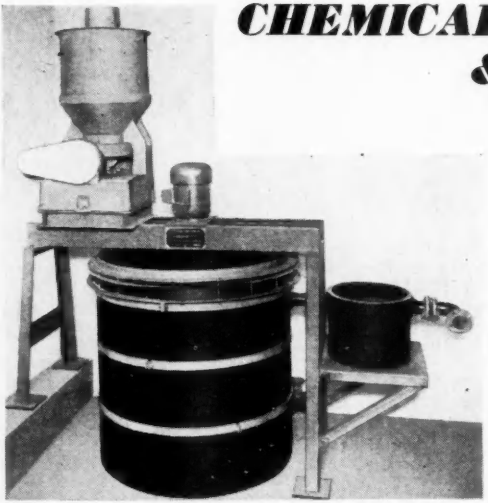
A typical Toilet Basin Installation showing 'PYREX' *Visible Flow* Sink Traps & Pipes.

James A. Jobling & Co. Ltd.
Wear Glass Works
Sunderland

The original and only makers of 'PYREX' Brand Glass in the United Kingdom.

MELAMINE MELAMINE MELAMINE


Hydrochloric Acid
Absorption Plant
in
'DELANIUM'
CARBON & GRAPHITE
If HCL absorption forms part of your process, this is worth your investigation.
May we explain how and why equipment combining the exceptional properties of DELANIUM materials with novel design and construction offers unique possibilities?
Our engineers will call on request at any time, entirely without obligation to discuss the matter in relation to your particular requirements.
Powell Duffryn
CARBON PRODUCTS LIMITED
Chemical Carbons Division, Springfield Road, Hayes, Middlesex.
Telephone: Hayes 3994/8
In the U.S.A.— Delanium Carbon Corporation



CHEMICAL PLANT & PROCESSES

The Kestner organisation serves many industries. In fact, wherever chemicals are manufactured or used it is more than likely that you will find some Kestner plant—it may be a stirrer or other small item—it may be a large spray drier or the entire process plant. Whatever it be, large or small, you will find it doing "a good job."

ACID HANDLING . ACID RECOVERY PLANT . AIR & GAS DRIERS . DRYING PLANT . ELECTRIC HEATING—ISOLECTRIC SYSTEM FOR PROCESS HEATING . FLUID HEAT TRANSMISSION SYSTEMS . EVAPORATION PLANT . GAS ABSORPTION & REACTION SYSTEMS KEEBUSH . LABORATORY & PILOT PLANTS . STIRRERS & MIXING EQUIPMENT . SULPHUR BURNERS

Kestner's *The Chemical Engineers*

5, GROSVENOR GARDENS, LONDON, S.W.1

ACIDS

Oleum
Sulphuric
Battery
Hydrochloric
Nitric
Dipping Acid
&
Distilled Water
supplied in any quantity

Scientifically Prepared for TRANSPORT ~ *ANYWHERE.*

SCM BRAND

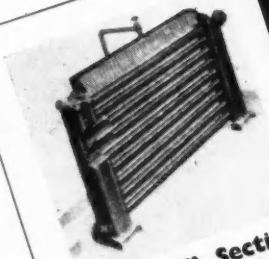
SPENCER CHAPMAN & MESSEL, LTD.,
45, Park Lane, London, W.1.
TELEPHONE: GROSVENOR 4311 (4 Lines)

KARBATE

REGD. TRADE MARK

IMPERVIOUS GRAPHITE

RESISTS PRACTICALLY ALL CORROSIVE CHEMICALS



"Karbate" Sectional Cascade Cooler

This cooler is made of 4 standard parts, in any of five pipe sizes—viz. 1 in., 1½in., 2 in., 3 in. and 4in. Prefabricated sections carried in stock for simple assembly to meet capacity requirements. Nine feet long single pipe sections are stacked to form a series flow vertical bank. Approximately 120 sq. ft. external surface area is available in all five sizes for 6 ft. high cooler.

CASCADE COOLERS

These coolers are recommended for service in practically all acids, caustics and organic solvents at pressures up to 75 lbs. per sq. in., and temperature up to 338 deg. F.

They are strong, durable, highly resistant to thermal shock and have a high rate of heat transfer.

Let us have your cooling problem and we will gladly assist you in selecting the proper size of cooler for your requirements.

Manufactured in England by:

BRITISH ACHESON ELECTRODES LTD

GRANGE MILL LANE · WINCOBANK · SHEFFIELD

TELEPHONE: ROTHERHAM 4836 (4 LINES)
TELEGRAMS: ELECTRODES, SHEFFIELD

BRITAIN'S LARGEST MANUFACTURERS OF GRAPHITE ELECTRODES & ANODES

FAMOUS STEPPING STONES

[near Ogmore Castle, Bridgend, Glamorgan.

Staveley basic chemicals are th stepping stones to a hundred and on industrial and agricultural chemicals— and many pharmaceutical products wit famous proprietary names.

Processes such as metal cleaning galvanising and vitreous enamelling als use Staveley chemicals.

The name Staveley has signifie the highest standard of quality for ove 200 years.

SODIUM ORTHOSILICATE, HYDROCHLORIC ACID, SULPHURIC ACID AND CAUSTIC SODA.

STAVELEY

BASIC CHEMICALS FOR INDUSTRY.

THE STAVELEY IRON & CHEMICAL CO. LTD. Nr. CHESTERFIELD

POSITIVE ROTARY

BLOWERS

AND LOW PRESSURE EXHAUSTERS

for outputs from 2 to 30 cu. ft. p.m. pressures up to 5lbs. sq.in.

Small Rotary Blowers are essential for many industrial purposes where a steady flow of air is required. A Blower to handle corrosive gases is now being developed.

Lennox

LENNOX FOUNDRY CO., LTD.

Tantiron Foundry, Glenville Grove, London, S.E.8

QUICKFIT

Are you Recovering HCl ?

Glass Plant is ideal for this purpose

Write for this informative booklet now.

QUICKFIT & QUARTZ LTD.

INTERCHANGEABLE LABORATORY GLASSWARE
INDUSTRIAL PLANT IN GLASS

Orders & Enquiries to Dept. QN, "QUICKFIT" WORKS, Heart of STONE, Staffs.
Phone : Stone 481

THIS *Fluidrive* CENTRIFUGAL

features: **ECONOMY**
EFFICIENCY
ADAPTABILITY

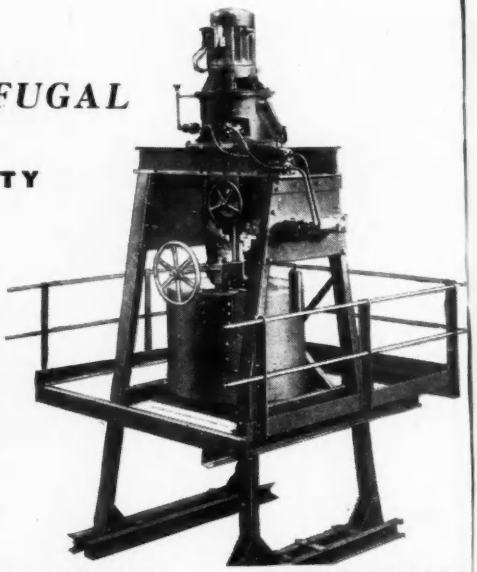
A "Vulcan-Sinclair" scoop tube controlled type hydraulic coupling is interposed between electric motor and centrifugal spindle, giving these advantages:

Continuous-running constant speed motor has low current consumption; there is no current rush when starting, and no wear on switch contacts.

Basket speed is infinitely variable; loading and unloading speeds can be easily controlled; acceleration is smooth.

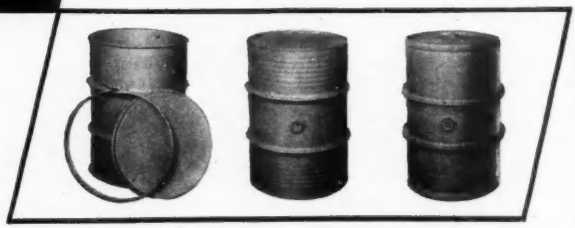
One handwheel controls acceleration, speed variation and braking.

A Mechanical Unloader with single wheel control can be fitted if desired. This Centrifugal can also be supplied with water motor, gear or belt drive.



POTT, CASSELS & WILLIAMSON · MOTHERWELL

"BRABY" REGD STEEL DRUMS



Our Liverpool Factory is equipped with modern plant for the production of Steel Drums of many types. These can be supplied with the exteriors painted, and several types can be galvanized, tin or lacquer lined. Certain Drums can be decorated in colour to display users' names and trademarks.

FREDERICK BRABY & COMPANY LTD.
HAVELOCK WORKS, AINTREE, LIVERPOOL, 10. *Tel. AINTREE 1721. LONDON: FITZROY WORKS, 352-364, EUSTON ROAD, N.W.1. TEL. EUSTON 3456. EXPORT: 110, CANNON STREET, LONDON, E.C.4. TEL.: MANSION HOUSE 6034. ALSO AT GLASGOW, BRISTOL, BELFAST AND PLYMOUTH.*

Rover Car Factory, Solihull. High intensity lighting in a body spray tunnel by fluorescent lamps in a glazed enclosure.

Tailored for the job

The lighting of many processes is vital to the smooth and rapid flow of work and to the quality of the finished product. For example, poor lighting could make a spray tunnel into a bottle-neck — each job taking a little too long, a little portion missed, a return to the spray line — and so the whole production line marks time. Whatever form it takes, good lighting not only helps to provide a satisfactory working environment but is an active production tool.

Fluorescent lighting is as good as daylight — only more consistent. It is efficient; it is economical; and it is *flexible*. You can 'tailor' it, easily and exactly, to the special requirements of production at all stages.

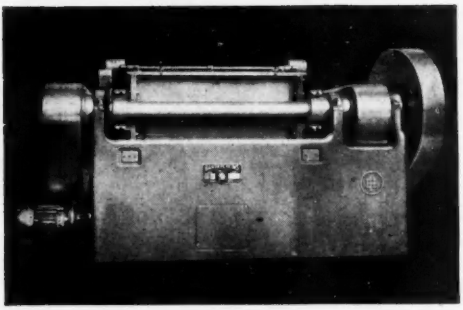
HOW TO GET MORE INFORMATION

Your Electricity Board will be glad to advise you on how to use electricity to greater advantage — to save time, money, and materials. The new Electricity and Productivity series of books includes one on lighting — "Lighting in Industry". Copies can be obtained, price 9/- post free, from E.D.A., 2 Savoy Hill, London, W.C.2, or from your Area Electricity Board.

Electricity for PRODUCTIVITY

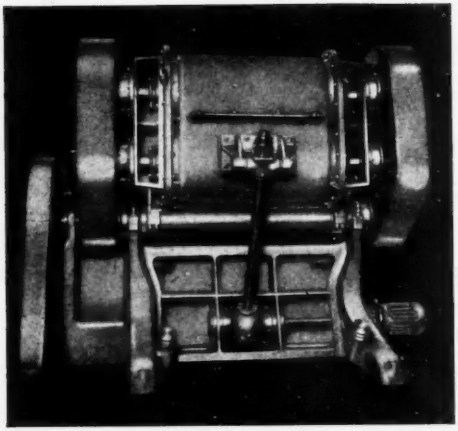
Issued by the British Electrical Development Association

UNIVERSAL MIXING MACHINES



Above. Front view of a Size 17 Type VIII Class B.B. for 176 gallons per mix.

Below. Rear view of same machine tilted for emptying.



"Universals" are produced in several standard types and classes to serve a wide variety of industrial purposes and are capable of numerous adaptations to special requirements. Capacities range in 19 sizes from 1½ pints to 2200 gallons per mix: troughs can be jacketted and blades cored for steam or brine circulation: many are supplied for mixing under vacuum and/or pressure: and we have had 75 years experience of making them.

In use today for Butter · Perfume and Cosmetics · Moulding Powders Gravy Salts · Foundry Sand · Pigments Pharmaceutical Products · Fertilisers China Clay · Paint · Soap · Dyestuffs Chocolate · Confectionery · Abrasives · Casehardening Compounds Spices · Patent Flour · Glass · Pickles Textile Finishes · Gypsum and other purposes too numerous to include here.

BAKER PERKINS LTD
Engineers
WESTWOOD WORKS – PETERBOROUGH

Volume LXIX
Number 1789

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

Telephone : CENTRAL 3212 (26 *lines*) *Telegrams :* ALLANGAS · FLEET · LONDON

CONTENTS · 24 OCTOBER 1953

Platinum Metals Exhibition	850
ABCM Annual Meeting	851
ABCM Annual Dinner	854
South African Newsletter	861
Radiofrequency Titration Technique	863
United States Potash	866
Maintenance Incentive	867
The World's Sulphur	868
Analysis of Cobalt—Part IV	869
The Chemist's Bookshelf	873
Home News Items	875
Overseas News Items	876
Personal	877
Publications & Announcements	878
Law & Company News	880
Next Week's Events	882
Market Reports	884

Editor : E. A. Running *Publisher & Manager : John Vestey*

MIDLANDS OFFICE : Daimler House, Paradise Street, Birmingham
Phone : Midland 0784/5

SCOTTISH OFFICE : 116, Hope Street, Glasgow, C.2.
Phone : Central 3954/5

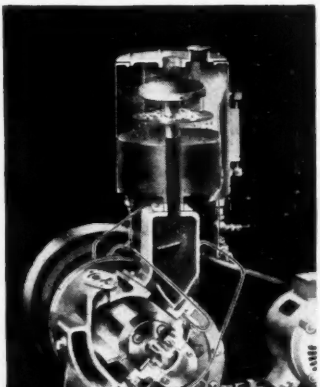
LEEDS OFFICE : Martins Bank Chambers, Park Row, Leeds, 1
Phone : Leeds 22601

SINGLE COPY 1/- (BY POST 1/3) ANNUAL SUBSCRIPTION 42/-

"Geryk" — all British

VACUUM PUMPS

FOR FACTORY OR LABORATORY PURPOSES



All Types and Sizes for All Duties

Wet and Dry Pumps

Reciprocating and Rotary

Single and Two-stage High Vacuum Pumps

List No. 3342

Pulsometer Engineering Co. Ltd.,
Nine Elms Ironworks, Reading.

"NORDAC"
REGD.
SOFT RUBBER LINING OF OLD OR NEW TANKS AT OUR WORKS OR ON SITE

"VULCOFERRAN"
REGD.
SPECIAL EBONITE LINING FOR HIGH TEMPERATURE WORK

DESIGN AND CONSTRUCTION OF SPECIAL PURPOSE PLANT A SPECIALITY

NORDAC LIMITED
COWLEY MILL ROAD,
UXBRIDGE, MIDDLESEX.
TELEGRAMS: "NORDAC," UXBRIDGE. 'PHONE: UXBRIDGE 5131

Date of Birth

FUNDAMENTALLY the problem of age and capacity for work is no doubt biochemical, but we know all too little about it. It is as a practical and empirical issue that the problem must be faced, and the chemical industry, as much as any other, must do its share of the facing. The national facts are simple and serious enough. In 1911 one person in every 15 was a man of over 65 or a woman of over 60; in 1951 two persons in every 15 could be thus age-grouped; by 1977, the proportion will rise to three in 15. We are living longer and families have for some time been smaller. Every retirement brings a loss of individual productivity, but the retired person continues until death to make a demand upon the national output of goods and services. Pensions or capital savings are, in the coldest light of economics, credit notes upon the country's future resources. To state this bleakly is perhaps unkind to the hard-working man or woman who has saved proudly and industriously in order to achieve independence in the last phase of living. But sentiment and delicacy will not postpone or solve the age/work crisis that lies so certainly ahead, when one person in every five will be above what we now regard as the age of retirement. It is a grave liability to a country already over-populated in relation to its land and material reserves.

Governments have long been accused of taking too little action at too late a moment, but in this particular matter the Minister of Labour and National Service acted with great foresight when he set up a National Advisory Committee. The Committee's first report, issued this month, should be quietly and sensibly considered by every thinking person in the country. It is very acutely the concern of those who are middle-aged workers today for they must inevitably become the 'over-60-or-65' retirees who meet the first furies of the future gale. 'In my view,' says the Minister in a foreword to the free and shortened version of the report, 'the more practicable and more desirable way to proceed is by the free exercise of public opinion.' That is to say, people who are not elderly today must think ahead and make up their minds about what can be done to ease the future age-group crisis. Anticipatory legislation by the Government could only be violently controversial in the present state of public opinion.

It is clear from the Committee's Report that, so far as voluntary progress towards a solution is concerned, employers and managers, more than any other class in the country, can give a lead. Present attitudes towards higher-aged workers are far too rigid. Should it be automatic for men to retire at 60 or 65 and for women to retire at 55 or 60? Should there be pre-determined age limits for new workers? Wherever these inflexible 'rules' of employment operate, the problem of the future—as well as that of the present—is being aggravated. It is rightly pointed out that there is no medical support for retirement at a fixed age; equally rightly, it is said that for new jobs or posts the tests for engagement should be capacity and not age. On both

these matters nothing could stimulate national re-thinking more aptly than a broadcast by a Prime Minister who made his greatest contribution to the country after reaching the normal age of retirement and who then returned to office at an age far above the maximum for any normal advertised post.

Undeniably it is a convenience for management to have age regulations wherever fairly large numbers of workers must be organised. The future of a business or factory is safeguarded if there is a steady inflow of younger workers when vacancies occur. Pension scheme finances are distributed when new workers enter at fairly high ages—here, indeed, the age of 40 is often an impassable barrier. The former reason for preferring to engage younger workers will to some extent cease to operate as the 1-in-5 situation of 1977 draws closer, for employers will not be able to exercise that preference so readily. The latter reason for not engaging older people may persist more obstinately, yet it is easily removable—pension schemes must be made more flexible, allowing older entrants to draw proportionately smaller pensions or even excluding them. The rigidity of pension systems in large organisations has long been a cause of wastage in national ability and skill. A man of 40 or 45 is often forced to remain in a safe but secondary position with a large company when, if it were not for the loss of his pension rights, he could take a more responsible position with a different and perhaps smaller company. It is not suggested that pension schemes should depart from actuarial bases; but their design could be altered.

The Committee recommends that all concerned be asked 'to consider how existing practices may be modified to admit the occasional late entrant and prevent the too early discharge of the efficient older worker.' It is likely to be quite easy to achieve progress in both these directions provided that a fresh climate of opinion on the age/work relationship develops among employers and managers. But this in itself, the removal and lowering of barriers against employing older people, is only a first step, no more than the opening of the door. Old or young, a worker must be worthy of his hire. The capacities and duties of older workers must be intelligently matched.

Here is a vast field for study in management and human relationships, and by no means all the responsibility falls upon those who manage and employ. The worker who continues beyond what is now the normal age of retirement must be willing to reduce both status and responsibilities, not only in his own interests but to ensure that a younger man's promotion is not retarded. It is no question of accepting demotion and defeat; it is a matter of sensible adjustment. As for engaging older workers in new jobs, on both sides there must be a practical realisation that advancing years bring certain limitations. The readjustment of work organisation so that a rising proportion of regular jobs, or even of part-time jobs, can be carried out by more elderly people is essential. We need far more research upon the whole problem of the age/work relationship. Today a typical working lifetime places a man at the peak of his reponsibilities from, say, 50 to 65, and at 65 plus-one-day he becomes responsible for nothing. Who can say that in many kinds of work the peak should not come sooner and that there should not be a partial shedding of responsibilities at 55 or 60 so that a lighter working load can be carried efficiently and without strain up to the age of 70?

It is perhaps not wholly irrelevant to add a footnote of a chemical nature. The severity of this future problem may not greatly affect those who today are middle-aged chemists; unless much more attention is given now to teaching of young chemists, there is little likelihood that chemists over 65 in 20 years' time will ever be compelled to retire. Their prospect in later life is overwork rather than dis-employment. However, this specialised difference does not absolve the chemical industry from the need to study the general problem; many of its employees are non-technical, and even with technical posts a planned easement of duties for older workers may substantially lengthen the total span of their careers.

Notes & Comments

Lead Arsenate Spray Residues

A PAPER by Dr. A. Pollard and C. F. Timberlake in the latest annual report from Long Ashton Research Station must be regarded as somewhat depressing for the future of lead arsenate sprays in apple orchards. This substance, despite the advent of DDT and other modern synthetic pesticides, is still widely employed for codling moth control. However, more stringent regulations for the amounts of lead and arsenic in fruit juices and ciders are being considered, and the whole question of spray residues and their effects may have to be re-assessed. The new Long Ashton experiments show that the problem of residues on apples varies according to the use to which the fruit is put. If apples are consumed fresh, the tolerance for lead is more likely to be exceeded than the tolerance limit for arsenic. But if apples are processed, the juice and even the extract from the dried press-cake that is used for pectin manufacture will be more likely to contain more arsenic than the permissible amount; indeed, this will be the most serious of the problems to be faced when and if lower limits of tolerance are introduced. There is, however, little likelihood that lead or arsenic in ciders will exceed new limits.

Acid Wash Can Help

IT has been found that the residues on apples can be reduced if, before processing, the fruit is washed with 1 per cent hydrochloric acid; as in any case fruit for processing is given a water wash, this will not involve a new operation. Without this acid wash, the new limits recommended by the Food Standards Committee will leave very little latitude where apples have had lead arsenate sprays as late as mid-July. It is normal practice to spray twice, the second operation being carried out up to mid-July. Although the difficulties can be eased by acid washing it seems more likely that juice and pectin manufacturers will exercise a preference for buying applies that have been given other spray treatments for pest control. It is true that cider itself presents little or no problem, but in modern cider factories much of the pomace or dried press-cake is used for pectin extraction; and with pectin solutions there is a definite risk of arsenic in excess.

New Uses for Antibiotics

NEW fields of application for antibiotic substances seem to be opening up at an incredible pace. Fish preservation is one example; here 1 ppm. of aureomycin in flaked ice has been found to lengthen the storage life of freshly caught fish. This work has already been carried beyond the laboratory to the pilot-test stage on Pacific trawlers. Spinach and other leafy vegetables can be kept fresh for longer if spraved with antibiotic solutions; for this, the most effective antibiotic tested has been streptomycin! It seems highly doubtful whether any food authority would ever permit this particular antibiotic to be employed as a food additive. The same substance has been found to be effective as a 0.025 per cent spray in controlling halo blight diseases of plants. Penicillin is the most effective among a number of antibiotics in acting as a control against foreign micro-organisms in grain fermentation processes. A number of beneficial effects in brewing are exercised by penicillin at a dosage rate of 0.75 to 2.0 units per millilitre of mash. We may yet be poster-instructed that 'Penicillin Controlled Beer is Best'! These new developments of potential developments are all reported from America. From Indian research we learn that the growth-ra'es of silk-worms are appreciably accelerated if aureomycin or chloromycetin are added to the diet: this does not increase the output of silk, however, unless extra nitrogen (as casein) is also provided. Casein itself will increase silk production, but the increase is multiplied several times in the presence of antibiotic substances. Terramycin, however, failed to exercise these effects in the Indian experiments at Bangalore. According to a recent statement in the United States, production of all antibiotics there is now 1,320,000

pounds per year, scarcely less than that of aspirin, produced at a rate of 1,340 000 pounds per annum! Such rapid expansion, and especially at a time when much of the scientific side remains to be unravelled, must find new outlets if the economic dangers of over-competition and demand recession are to be safely avoided. The pig and poultry feed supplement demand has significantly aided antibiotic economics already, and any other non-medical use likely to create regular orders is bound to be investigated to the limits of practicability.

Platinum Exhibition

Duke of Edinburgh Performs Opening

MORE than 200 distinguished representatives of Government, Church, Military, Science and Industry attended the luncheon given by the Institution of Metallurgists on the occasion of the opening of the Platinum Metals Exhibition by H.R.H. The Duke of Edinburgh on Monday, 19 October. As many, if not more, Press representatives, company employees and friends, attended a cocktail party in the evening and met the directors of the four firms who co-operated with the Institution in arranging for the exhibition, which was planned to mark the 150th anniversary of the announcement of the discovery of palladium by W. H. Wollaston.

Opening the exhibition, the Duke of Edinburgh congratulated the Institution on the organisation of the exhibition and said that Wollaston was the great pioneer of powder metallurgy. The exhibition, he said, would act as a reminder that developments in engineering did not depend solely upon bright ideas and inventions. They were very largely dependent upon the properties of the new alloys which metallurgists could provide and they had every reason to be proud of the outstanding achievements of British metallurgists.

The exhibition, which consists of historical, chemical, electrical, metallurgical and artistic sections, is being held in the Park Suite, Grosvenor House, Park Lane, London, and was opened to the general public on Thursday, 22 October, and remains open until 8 p.m. this evening (Saturday). As well as a number of very interesting historical exhibits, there was also a large number to show the innumerable uses of platinum, palladium, rhodium, etc., in the fields of industrial chemistry, medicine, electricity, pottery, jewellery manufacture and industry as a whole.

Exhibits, some of them almost priceless, have been loaned by individuals, Government institutions and museums in several countries. Others have been supplied by the four firms in Britain producing the platinum metals.

The Duke of Edinburgh accepted, on behalf of H.M. The Queen, a powder box made entirely of metals of the platinum group. The box, the gift of The Institution of Metallurgists, weighs approximately 265 grams and was designed by Mr. Stephen Gooden, C.B.E., R.A. The top cover is made from a hard stiff alloy containing 80 per cent platinum and 20 per cent iridium. The body of the box is made in a 80 per cent palladium-20 per cent rhodium alloy.

Less Magnesite in USA

CRUDE magnesite production in the United States of America decreased 24 per cent in 1952 from the 1951 figure, according to reports by producers to the Bureau of Mines, United States Department of the Interior. The drop was mainly as a consequence of a strike which closed most domestic iron and steel plants for two months or longer. Caustic-calcined magnesia and refractory magnesia sold or used by producers decreased 24 and 10 per cent, respectively. Dead-burned dolomite sold by producers in 1952 was only 2 per cent below the quantity sold in 1951 because the increased demand by plants producing primary magnesium approximately balanced the decreased consumption in basic open-hearth iron and steel plants. Production and sales of USP and technical specified magnesias, precipitated magnesium carbonate, and magnesium sulphate decreased in 1952 from 1951; production and sales of magnesium hydroxide, nitrate, and chloride increased. The magnesium chloride production increase in 1952 was more than 100 per cent, owing to continued demand for magnesium metal by defence industries and for national stockpile purchases. Estimated world production of magnesite in 1952 was the same as in 1951. Austrian production reached a new record exceeding the previous record of 1951 by 12 per cent.

Industry to Increase Productivity

Chairman Outlines Steps Taken at ABCM Annual Meeting

DURING the course of his speech at the 37th annual general meeting of The Association of British Chemical Manufacturers which was held in London on Thursday, 15 October, the chairman, Mr. C. G. Hayman, drew attention to the steps being taken by the British chemical industry to increase productivity. Further mention of this subject was made in the Association's annual report.

Mr. Hayman's address, in part, was as follows:—

In my address to you last year, I referred to the forthcoming publication of the report of the Heavy Chemicals Productivity Team, which visited the United States in the spring of 1952, under the able leadership of Mr. Grange Moore. This report proved to be one of the best, if not the best, of some 60 reports of teams from various sections of British industry who have made similar visits.

Steps were taken to ensure that the report had a wide distribution both inside and outside the industry, and jointly with the Association of Chemical and Allied Employers and the Trade Unions, we appointed a Steering Committee to stimulate the study of the report by the industry and the carrying out of its excellent and far-reaching recommendations in-so-far as they were feasible.

Great Interest Shown

The Council is gratified by the great interest which has been shown throughout the country, as manifested by the attendances at the six area meetings which were arranged.

Area Committees have now been set up to continue this work in their particular districts, operating as may be found helpful, in close association with the local committees set up by the British Productivity Council. This will be a long term task. There is no magical formula by which productivity can be increased over-night.

In my youth we would have said the answer was a simple one—just harder work. But times have changed; the method now is to use machines and by studying every operation in detail so to organise production that greater output and efficiency is obtained without increased expenditure of human effort. This is the standard dictated by our highly-geared economy and the improved social conditions of labour. At this point I think I should stress the importance both of instrumentation and work study.

The Association has recently sent out a reprint of an article by a Mr. Young, on instrumentation and productivity which sets out very lucidly and pointedly the factors involved. I would ask you to study that paper, because the next move must come from you. You must re-examine your production problems from the instrumentation angle and formulate your requirements. The instrument makers are eager to co-operate in the design and supply of equipment to meet your needs.

With regard to work study, many of you attended the excellent conference organised by the Association at Buxton last weekend, with the generous co-operation and assistance of I.C.I. and its work study team. We are indeed grateful to them for what they have done to assist the chemical industry as a whole to appreciate the significance and potentialities of the work study techniques.

Sir Oliver Franks, former British Ambassador at Washington, and Mr. C. G. Hayman, chairman of the ABCM, at the annual dinner on Wednesday

A set of the lectures given has been sent to all delegates. A record has been made of the main points emerging at the various discussion groups, and a composite volume will be published shortly covering the papers and the discussions. Everyone in the industry will find it a profitable source of information, which will repay close study.

To implement the Heavy Chemical team's recommendations, more scientific and technical personnel of all types are required. We shall shortly issue a questionnaire in an attempt to estimate as accurately as possible the requirements of the industry in, say, five years time, so that steps can now be taken to augument the supply. This is a matter of vital importance if our development programme is to be really effective.

Progressive & Virile Industry

A brief reference is made in the annual report to the data collected on the forward plans of the chemical industry. Under the guidance of the Steering Committee a report is being prepared as a supplement to the 1949 Report, covering an interval of four years. May I give you just a few figures to show that the progressive and virile character of our industry is being well maintained in spite of difficult conditions.

The annual expenditure on research and development was £8,500,000 in 1949; it is now £11,200,000, and when the further schemes of expansion are completed, it will rise to £12,700,000, a further increase of 14 per cent. This shows that there is no lack of enthusiasm for progress through research. The plans for expansion of production are most gratifying. In 1949 the estimated cost of the schemes then in hand and contemplated, was just over £190,000,000; 75 per cent of these by value were completed by the end of 1952, at which time the forward plans for 1953 to 1957 inclusive were estimated at the even larger figure of £230,000,000. Such expansion arising from so many sections of the industry surely reflects the truly competitive spirit, and no-one can fairly claim that an industry which is spending these sums lacks enterprise, courage or direction. We can only hope that the economic conditions of the world will enable us to secure profitable markets for our output.

This brings me to the question of publicity and the vexed problem of exhibitions. Interest in the BIF has waned and the chemical section is no longer representative of our great industry. With the increasing competition which now faces us in the world markets, we must carefully consider the form of publicity which will give us added prestige in the eyes of foreigners. New approaches to this problem are now being explored, and I would ask you all to give them careful consideration as a matter of high level commercial policy.

The Papilloma Research Scheme has been fully covered in the annual report, but I shou'd like to add that all concerned deserve our congratulations on the excellent work done, which has earned them the commendation of the Government Departments concerned.

In 1951 the industry was suffering from a shortage of various raw materials, the more important of which were sulphur and various coal tar distillation products. The position naturally eased with the trade recession in 1952. The sulphur problem is being largely overcome by the more extensive use of pyrites and anhydrite and of other home sources of sulphur-containing materials, and also by greater economy in the use of sulphuric acid. The earlier difficulties with coal tar products, however, are likely to recur. I am aware that the position is being watched, but I think it is appropriate again to emphasise the need for close collaboration between those concerned with the production and with the consumption of critical raw materials, with a view to minimising as far as possible the harmful effects of shortages or surpluses.

Move to New Premises

The Association will be moving in March next from the premises we have occupied at 166 Piccadilly, since its formation in 1916. The accommodation is inadequate and working conditions leave much to be desired. The landlords cannot offer us the required additional space, but I am glad to say we have found suitable office accommodation in a central area. In spite of an increase in the volume of work, the staff have carried on splendidly during the past year under adverse conditions, and I am sure you will wish me to express to them your sincere appreciation and thanks for their loyal and efficient service.

I now come to the end of my tenure of office as chairman. Normally the period is two years, but as in the case of my predeces-

sor, our president, Sir Harry Jephcott, circumstances led to an extension of one year. This extension has been made easier for me by the consideration, understanding and help which has been so freely given by my colleagues on the Council and by the Director and his staff. I should like to pay a special tribute to Mr. Davidson Pratt, in grateful recognition of his unflagging energy and inspiration, which is of great service to this Association.

The problems confronting our industry tend to increase rather than diminish, and there are clouds on the horizon. This association has a good record of service to its members, but the future will make even greater demands upon it. With the active co-operation of its members, it can render vital service to the industry and by concerted effort grapple resolutely with the problems which lie ahead.

Finally, may I express simply and sincerely my grateful thanks to my brother officers and colleagues on the Council for the loyal support and consideration which I have consistently enjoyed during my three years of office.

In the section on productivity in the annual report it is stated that no reply has been received yet to the invitation for an American Team on Heavy Chemicals to visit this country.

The report also contains sections on Chemical Engineering and Chemical Plant, Trade Effluents and Water Supplies, International Trade, Safety and Transport, as well as on other important topics.

The Annual Report

In the first it is revealed that Major Bramwell has visited a considerable number of members of the ABCM and of the British Chemical Plant Manufacturers' Association in connection with the survey of chemical engineering data and facilities for research and hoped to submit his report to the two Associations in the autumn. It is also stated that a joint committee from the ABCM and the BCPMA spent considerable time trying to draw up a set of standard contract conditions for the purchase and erection of chemical plant but had eventually been compelled to abandon the idea as impracticable in view of the diversity of circumstances.

In the section on trade effluents it is reported that, at the request of the Federation of British Industries, an Analytical Subcommittee had been set up to advise on analytical methods in connection with river pollution. A memorandum had been sent to all members briefly outlining the importance of recent developments in this field.

The Trade Effluents Committee was co-operating with the London and Home Counties Regional Advisory Committee for Higher Technological Education in examining the need for full-time, one year post-graduate courses in chemical technology, particularly in connection with the chemical factors involved in water purification, sewage, river pollution and the disposal of trade wastes. By invitation from the Board of Trade the Association had sent five representatives to a preliminary conference held in Paris on 30 March to discuss the desirability of organising an European investigation and tour of examination on methods of dealing with air and water pollution. The European mission might be a preliminary to a similar mission to the United States.

With reference to international trade problems, the officers of the Association had met the President and senior officials of the Board of Trade on 18 May. They had told the President that the principal factors affecting the industry were shortage of cash resources and competition in world markets. The problems associated with entering the US market were emphasised and it was forecast that export volume to that market might decrease in the future and that sales there would continue to be specialities or basic materials in short supply. There was a possibility of a further increase in the number of requests to the Australian Tariff Board for the protection of their home chemical industry in view of the rising costs in Australia.

The annual report was unanimously approved.

The Election Results

The elections at the annual general meeting resulted in the following constitution for the Council for 1953/54:—

President: Sir Harry Jephcott.

Vice-Presidents: Dr. F. H. Carr, C.B.E., Sir Roger Duncalfe, Dr. E. V. Evans, O.B.E., Mr. C. G. Hayman, Dr. P. C. C. Isherwood, O.B.E., Mr. C. F. Merriam, M.C., Mr. L. P. O'Brien.

Elected Members: *Chairman*, Mr. W. J. Worboys; *Vice-Chairman*, Mr. G. F. Wil-

liams; *Honorary Treasurer*, Mr. J. L. Harvey, M.B.E. Dr. A. E. Everest, Mr. I. V. L. Fergusson, Dr. W. H. Garrett, M.B.E., Mr. J. C. Hanbury, Mr. B. Hickson, Dr. W. G. Hiscock, Mr. G. E. Howard, Mr. L. G. Matthews, Mr. F. G. Pentecost, Mr. H. V. Potter, Mr. C. R. Prichard, Mr. K. H. Wilson, O.B.E.

Co-opted Members: Mr. B. A. Bull, Mr. E. M. Fraser, C.B.E., Mr. T. M. Willcox.

Honorary Vice-Presidents: Mr. C. E. Carey, Mr. N. N. Holden, Lord McGowan, K.B.E.

Director and Secretary: Mr. J. Davidson Pratt, C.B.E., M.A., B.Sc., F.R.I.C., M.I.Chem.E.

Manager: Mr. A. J. Holden, B.Sc., F.R.I.C.

In recognition of his services as honorary treasurer for the past 12 years, Mr. C. E. Carey was elected an honorary member and honorary vice-president of the Association.

The Annual Dinner . . .

THE annual dinner was held at the Grosvenor House Hotel, London, on 14 October when once again well over 900 members and guests were in attendance. The toast 'Our Guests' was proposed by Mr. Hayman and the Rt. Hon. Sir Oliver Franks, P.C., G.C.M.G., K.C.B., C.B.E., lately British Ambassador at Washington, replied.

The chairman, in proposing the toast, said in part:—

We have with us the Permanent Secretary of the Ministry of Supply, Sir James Helmore, and of the Ministry of Materials, Sir Eric Bowyer. Sir Frank Lee had intended to come this evening, but he was prevented from doing so, and in his place we are very glad to welcome Sir Maurice Dean, Second Secretary to the Board of Trade. It is very appropriate and fitting, and indeed a pleasure, to welcome Sir Harry Pilkington to our gathering this evening. He is the new president of the Federation of British Industries, and he is accompanied by his predecessor (they should have confidences in common) who has now, shall I say, turned into steel, Sir Archibald Forbes. It is a pleasure also to welcome Dr. Alexander Fleck, chairman of the I.C.I. I should like to tender to him your congratulations, and above all your best wishes, on his assuming this high office. I should like to welcome Sir William Slater, the Secretary of the Agricultural Research Council, and Lieut.-General Eldridge, Controller of Supplies (Muntions), Ministry of Supply. I also welcome Sir George Barnett, the Chief Inspector of Factories, and Dr. Wansbrough-Jones, the Chief Chemist, Ministry of Supply.

May I in a general way extend our welcome to Government Departments, Trade Associations, scientific and learned societies, for their presence; and last but not least give a welcome to our old friends, and occasionally our mentors, the Press. That I am sure you will accept as a general covering, but none the less a very cordial welcome, to all our guests.

At this point I should like to refer to the late Sir Archibald Rowlands, formerly Permanent Secretary to the Ministry of Supply, who was with us last year. He was well known to many of you in this room. You may be aware that he retired in the normal way from the Ministry only a short time ago and took up an industrial appointment. His untimely passing only serves to focus even more sharply the indelible services that he rendered at the Ministry of Supply. I am quite sure that you will all wish to pay tribute.

Last year most of us were conscious of the approach, or indeed the existence, of a trade recession which became very marked in most sections of the industry. I think it will be agreed that this shake-out (shall we call it) had a salutary effect and injected more realism into our trading operations. Conditions have undoubtedly improved during the past six months, but the earlier conditions and particularly the continental and other foreign competition have inevitably pulled back our figures so far as the export trade is concerned.

I do not want to weary you with too many figures, but I think it is desirable to quote some. So far as total exports in 1952 are concerned, the figure was £138,000,000. That compares with a record figure of £143,000,000 in 1951. Of course, that is not a catastrophic change, but it is a trend in the wrong direction.

Turning to the other angle of the problem, namely, new construction, I think you will find the picture much more encouraging. In

1948, the schemes then foreshadowed for expansion were of the order of £190,000,000. By far the greater part of those schemes will be completed by the end of this year. Now that, gentlemen, is all the more remarkable when you have regard to the policy of the Government at the time in relation to the export of chemical equipment and plant—a sort of hothouse export policy, by which so much capital equipment was exported at the expense of our needs at home. You might call it, in the vernacular, shot-gun therapy because of its short-term advantages—with due apology to any representatives of drug houses here this evening! Further expenditure in this capital construction phase of the order of £230,000,000 is now scheduled or under contemplation.

In the vital matter of research, whereas in 1948 our annual expenditure was £8,500,000, the present figure is £11,500,000, and fairly soon it will reach the sum of nearly £13,000,000. I think that this clearly indicates confidence in our ability to progress, and also shows the competence and courage of those running the chemical industry.

While this is not an arena in which one should or can speculate on political motives, I do think it can be claimed that the chemical industry is second to none in this country in terms of enterprise, growth and public service in peace or in war. Taxation, however, still acts as a serious brake on capital projects. The Chancellor of the Exchequer, Mr. Butler, in his last Budget and in circumstances of great difficulty, performed a superb act of faith in making a notional reduction in taxation. It is to be hoped that he will pursue this religious exercise with increasing fervour. He knows full well that true growth and enterprise can only spring from the fruits of past achievements. Let us hope that by matching his gestures with our own solid performance, we shall before too long escape from this strait-jacket of penal taxation.

I should like to touch briefly on two further matters. Last week the ABCM organised a two-day conference at Buxton where, with the generous and expert help of the I.C.I., a series of lectures and discussions were held on work study, at which over 500 directors and senior executives attended. I think it can be claimed that this conference was an outstanding success. The need for increased productivity is urgent. We hear the word so often that it becomes almost hackneyed, but the need is there, and I would suggest that this science, if you like, of work study is at least one of the main roads to achieve that end. We hear

Sir Maurice Dean, K.C.M.G., C.B., Second Secretary, Board of Trade; Dr. Alexander Fleck, chairman, Imperial Chemical Industries, Ltd.; Sir James Helmore, K.C.M.G., Permanent Secretary, Ministry of Supply; and Sir Archibald Forbes, past president of the FBI

Mr. G. S. Bache, president, British Chemical and Dyestuffs Traders' Association; Dr. W. E. de B. Diamond, Director, British Plastics Research Federation; R. Lowe, chairman, Association of British Sheep and Cattle Dip Manufacturers; and Mr. F. G. W. Paige, secretary, British Chemical and Dyestuffs Traders' Association

criticisms of the chemical industry in certain quarters these days, but I feel that I can express your views by saying that we do not regard our industry as being on public trial or, indeed, in the sick bay. We did not go to Buxton to take the waters. We went there fully representative of this great industry to make common cause, and, if I may say so with due acknowledgments to the Monopolies Commission, to connive at restrictive practices. Those restrictive practices were to restrict the waste of plant, manpower and energy and materials to the minimum. While we have much experience and knowledge on which to draw to guide us in what one might call the material aspect of this problem, I should like to emphasise to you that the human element figured prominently in all those studies. There was no doubt that it was recognised—and rightly so—that human endeavour and pride of achievement are still two of the greatest potential assets that we have. Work study does enable those qualities to be not merely recognised and encouraged, but rewarded. A complete report of the proceedings at Buxton will be published very shortly.

May I add that the Buxton Conference was not the beginning of the story, nor was it the end. It did not pretend to be a cure for all economic evils, but it was a tremendous springboard of opportunity; indeed an arsenal, if we so use it, to equip us in the running fight with the continuous challenge of the economic problem of our time.

My second point concerns exhibitions. Here, indeed is a patient somewhat sick and ailing. The lack of interest, or the dwindling interest, in the British Industries Fair during the last two or three years shows clearly that something is wrong. It may be us, it may be the Exhibition; but I would advise you that the ABCM have committees which are devoting themselves at this time to preparing a revised plan or a new conception, if you like. I would only say at this point: as I see it, in this great competitive age we have two things to do to sell—one is to use the broad avenue of publicity; the other is personal sales promotion. If you like, your sales promotion men, your salesmen, are the actors on the stage. It seems to me that those actors will perform better if the stage is properly prepared. I suggest to you that exhibitions, tiresome though they may be (I think sometimes that we expect to much of them), serve their purpose, and I therefore ask you, when these revised proposals are published, to give them your very earnest consideration and, I hope, your support.

Finally, a word about our Association. It does, as you know, embrace in its membership the greater part of the chemical industry. I think you will agree that it has over the years rendered real service. The problems on the horizon suggest that the responsibilities of the Association will indeed increase in the years to come, or at any rate that it will be provided with greater opportunities. Those opportunities can only be used with the individual and collective support of the members of the Association.

Therefore, may I put it to you: please use your Association and let it serve you.

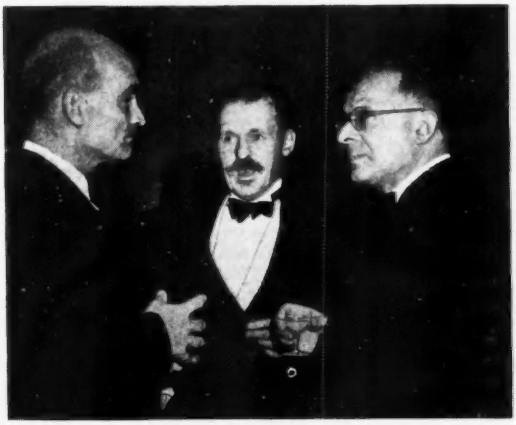
Sir Oliver Franks is probably best known to us as being in charge of the Raw Materials Department of the Ministry of Supply, and his lucid and active mind was of immense value in sorting out those tangled, competing rival claims and needs, and he earned deservedly the highest praise. However notable his service with the Ministry of Supply was, I think you will agree with me that his outstanding record of service to this country was as Ambassador to the United States from 1948 to January of this year. It seems to me that the role of Ambassador makes a strong call upon all the human qualities, and in this particular connection I would say that as between two peoples whose language basically is the same —with perhaps, shall we say, a few intonal and other variations—there is a greater proneness to misunderstanding than there is when you are dealing with foreigners in a foreign language. Perhaps I might introduce another interpretation and say that it is rather as with relatives—they always take too much for granted. But Sir Oliver's record in the United States clearly shows that, while worthily upholding the traditions of this old country, he was able to breed understanding and goodwill wherever he went, and for that service we are all grateful.

Replying, Sir Oliver Franks said:—

At this moment I find myself in a divided state of feeling. With one part of me I am happy to find myself once again among so many members of the chemical industry with whom I worked for so long and so happily during the years of the war; but there is another side to it, and there my feeling is very different. For I have to confess that, like the word 'chemistry' itself, your great group of industries fills me with wonder and bewilderment. I think it is perhaps in part because in my education, to use the fashionable word, I was under-privileged. I was only allowed to study the subject called chemistry for one term.

I suppose I had another chance when I was at the Ministry of Supply, for quite a number of you were controllers of the different industries which form your great group of chemical industries, and from time to time the controllers of these different groups used to come into my room very kindly and tell me a few words about what was going on. I remember, for example, Mr. Tony Board (whom I am glad to see present) used to come in. Now, he had an absolute mania for moving stuff about in tankers. Sometimes he moved molasses about, he told me, but when he got tired of that, it was alcohol, and on occasion, just for variety's sake, he called it acetone! When I said to him, "Does it not make a difference?" he just beamed at me and said that it all came to the same thing in the end.

Then there was another group in the Department which I could never understand. They always used baby language. They came from places like Speke and Barnard Castle, and the first time that they met me they were interested in something they called 'moulds.' They said it was coming



Mr. P. B. Mair, Dr. W. P. Kennedy, and Mr. M. Briscoe

along nicely. It had passed the bottle stage. Well, I listened, and they went away. In a few months' time they were back again to tell me that it now had teething troubles and I was just about ready to believe that the next time they came they would tell me that it could speak! (Speke). But they said instead that its name was penicillin.

A Layman's Observation

Now, Gentlemen, you will understand that your activities fill me with wonderment, bewilderment and awe. But there is one observation which, as a layman, I think I may make to you this evening. Not very long ago I discovered, for the first time anyhow in my own thoughts, when reading an article by Professor Phelps Brown of the London School of Economics, that the standard of living which we in this island of 50,000,000 people seek to maintain and to improve has not been anything very stable over past decades. Now, I am not going to talk to you about the things to which the Chairman has referred—that great programme of plant development that you have carried out in the last five or six years, nor the further programme that lies ahead of you; nor, indeed, about that great record of expansion in exports by which you have contributed so greatly to the improvement of our position in the years since the war. I am going to talk about something still more elementary and important—the relationship of your group of industries to our standard of living.

What I gathered when I read this article was that if you look back, there have been long periods in which productivity and its correlate, real income, have steadily and markedly risen, and there has been a long period in which things stood still, in which productivity hardly moved and real income did not rise. From about 1860 to 1885 productivity and real income rose fast and steadily. In the subsequent decade the process slowed down, and from something like 1895 to 1914 productivity, real income, and the standard of living remained almost stationary, and only picked up again after the First World War, in the '20's and '30's.

Now, that is not the sort of view in which I have been brought up. I looked back to the early years of this century, with my earliest memories, as years of Edwardian affluence and prosperity, and I remember, as you all do, the grim picture of the early '30's. But that view did not fit, and the ordinary explanations did not fit either. It cannot be explained by the movement of the terms of trade. The movement of the terms of trade was not big enough to account for it. You cannot explain it by movements in capital investment. We did not stop our capital investment between 1895 and 1914. We went on with it. Even those things we have bothered about so much—and rightly—since the war (to some of which the Chairman referred), such as efficiency in management, efficiency of labour (I think of all those Productivity Teams that have gone to America in the last few years), even those things, though they were discussed at the time between 1895 and 1914, do not explain it. For, you know, there is very little that is absolutely new in this world. In 1902, Mr. Alfred Mosley took 23 Trade Unionists to the USA to study the higher productivity there, and *The Times* correspondent who went with them and reported on their journey used words and phrases which you might have taken out of the views of any Productivity Team of the last six years that visited the USA. It is true that the first teams that went to America for that reason went in the 1850's. So all through this period of which I am talking you had people worried, and rightly worried, about the increase of efficiency in management and the increase of efficiency in labour: and you cannot find an adequate reason for what happened between 1895 and 1914 in any question of efficiency of management or labour or the relations of management to labour.

Sir Oliver's Explanation

What was it? I want to suggest to you this evening that it was something broader and more simple than any of these things. If we look back to the times of my grandfather, 1860 to 1885, what happened then was that you had the massive application through many branches of industry of two very great groups of inventions, steam and steel, and in those 25 years railways were built, power was utilised, machines were made on a scale revolutionary in its extent; and it was that which produced the sustained rise in the standard of living and in productivity in the middle of the Victoria era. You may say, 'But surely steel was invented before that, and the steam engine goes back to the beginning of the Industrial Revolution.' So it was, but the massive applica-

tion of those inventions, their spreading through the whole body of industry, their altering and revolutionising the processes by which things are manufactured, that occurred between 1860 and 1885.

It was not until the First World War, it was not until we got to the '20's and the '30's that the next great lift began.

That, Gentlemen, is where you come in. There are three industries which sustained in the main that movement of the '20's and the '30's. There were three great sets of inventions which then came to their massive application in the industry of this country – electricity, the internal combustion engine in the motor and aircraft industries, and the chemical industries.

You have got a much older history than that. You go well back into the 19th Century, but even in 1911, if I put together all the operatives, all the workpeople, in the electricity industry, the motor industry and the chemical industries, they add up to a little less than a quarter of a million out of 13,500,000 employed in the country. Then you were small-scale, however fast you were expanding, however violent your technical progress. It was only during the First World War, during the '20s and '30s, that you massively applied what you had invented and discovered, and it was because you did that that the standard of living rose, that real income increased, and that we sustained this forward effort of the nation.

Special Responsibility

Why do I tell you all this? Because I think that on your group of industries, together with the other two I have mentioned today, there rests a rather special responsibility. That responsibility, as I see it, is twofold. After all, it is in the memory of many people who are sitting here tonight that there was that period of 20 years in which productivity did not rise, in which real income in this country did not increase; and you know better than I do that we could not afford another 20 years like that. When we look ahead to the late '50s and the '60s, we recognise that it makes a great deal of difference whether productivity goes on rising and, with it, our standard of living.

I believe that it is to you that we have to look. We have to look to you to see that this period of the rising curve of the '20s and the '30s and the '40s is prolonged, that you, by your ingenuity, by your application of your discoveries, by the width of their application, continue so to lift our economy that productivity moves up higher.

Dr. W. H. Garrett, M.B.E., and Professor C. K. Ingold, F.R.S., president of The Chemical Society

But there is more to it than that. I hope that there is in this curious modern combination which is the chemical industry—the business man who sees and, in the good sense of the term, exploits the opportunity; the scientist who discovers and invents the new process and tames nature to the usage of man; the engineer who takes that process and makes it capable of large-scale production in great plant so that millions can benefit from it—I hope that this unique combination of business man, scientist and engineer may find together that germ of the great new invention which, when our children and our children's children begin to grow up, will then supply that lift in productivity which will no longer be given by what you have already been doing and are doing now.

Let none of us think that progress, productivity, the rise in real income, is assured. It is not. There has been this long lag and delay; I think it depends in our age, not on our wealth of raw materials, not on our physical resources; it depends on our wits and on our guts. And you gentlemen in the chemical industry are the industry of the middle of the 20th Century, and therefore it is up to you to find something pretty good in the second half of this century.

Fellowship in Metallurgy

United Steel Companies Announcement

THE United Steel Companies, Limited, announce that they have established a Research Fellowship in Metallurgy in the University of Sheffield and this will be tenable in the Department of Metallurgy.

The object of the fellowship will be to advance metallurgical knowledge and not to train men for research. The persons to be appointed from time to time will therefore be those who have already served their apprenticeship in research and have shown ability to conduct independent investigations. The field of study within which they will be expected to work will be ferrous metallurgy, but this does not exclude the appointment of researchers in refractory matters, knowledge of which is of great importance in ferrous metallurgy.

The fellowship will be awarded by the senate of the university. The normal period of tenure will be five years and the fellow will be appointed initially for two years and then annually; remuneration will be a minimum of £750 for the first year, rising by annual increments of £50. Arrangements for appointing the fellow are in hand, and the post is now to be advertised.

The United Steel Companies state that they are establishing the fellowship since they believe that more research of a fundamental kind into metallurgical problems will be the better for all concerned in the industry. Moreover, this type of research is particularly suitable to be undertaken in a University, especially that of Sheffield.

Oil & Colour Chemists

ARRANGEMENTS for the 6th Technical Trades Exhibition organised by the London Section of the Oil & Colour Chemists' Association are now well advanced.

The Exhibition Sub-Committee are carefully considering applications to exhibit. For this occasion a standard shell scheme for exhibitors will be utilised and an exhibition stand contractor has been appointed. This, it is felt, will give greater uniformity to the exhibition and tend to stress the technical content of the stands.

There should be also a saving in cost to the exhibitors.

The exhibition, which has become established as one of the highlights of the Association's yearly activities, will be held at the Borough Polytechnic, Borough Road, London, S.E.1, on 12-14 April, 1954. The times of viewing have been fixed by the committee as:—Monday, 12 April, 3 p.m. to 8.30 p.m.; Tuesday, 13 April, 2 p.m. to 8.30 p.m.; Wednesday, 14 April, 2 p.m. to 7.30 p.m.

There will be no charge for admission. Copies of a descriptive brochure, which will be issued early in the New Year, can be obtained upon application to the General Secretary, Oil & Colour Chemists' Association, Memorial Hall, Farringdon Street, London, E.C.4.

'Terylene' for W. Germany

IMPERIAL Chemical Industries, Limited, have licensed two companies in Western Germany to produce 'Terylene.' They are Farbwerke Hoechst AG, of Frankfurt, and Vereinigte Glanzstoff-Fabriken AG, of Wuppertal-Elberfeld. Western Germany thus becomes the third European country to take up Britain's outstanding synthetic fibre. I.C.I., who hold the world rights for 'Terylene,' except for the USA, have already licensed Italian and French companies, and in Canada a £7,000,000 'Terylene' plant is under construction by an I.C.I. subsidiary—I.C.I. of Canada, Limited. I.C.I. investment in 'Terylene' in the UK is now nearly £20,000,000, and results of the big development programme have more than confirmed the original estimation of the great potential for this new fibre.

New Edible Fats Preserver

FROM Holland it is reported that the 'Naarden' chemical concern research workers have succeeded in developing a new product which prevents edible fats from becoming rancid. The new product contains esters of gallic acid, namely, octyl and dodecylgallate, the effect of which is described as 'simply astounding.' It is claimed that lard containing 0.01 per cent of octylgallate will keep fresh for more than 780 days (as against the normal 60 days or so). In the case of whole milk powder, the preparation will ensure soundness for 300 days instead of 40 to 50, and corresponding results have been obtained with cod-liver oil, dried soups, vegetable oils, etc.

South African Newsletter

From Our Own Correspondent

A FABULOUS strike of unspecified ore was recently reported to have been made in Namaqualand, and news has also been received of another important find of rare minerals in the eastern districts of Fort Victoria in Southern Rhodesia. Mr. V. S. Welsford, a Johannesburg mining consultant, said that intensive prospecting in the area by Mr. George H. Nolan had resulted in the discovery of rich deposits of petalite, one of the minerals used in modern glass manufacture, and also lepidolite and beryl.

'Mr. Nolan has just returned to Rhodesia from a visit to Britain and the United States and has secured important contracts for petalite, which he is producing by modern mechanised means,' said Mr. Welsford. 'He has also installed a modern treatment plant for alluvial and reef tantalite, and will soon be producing five tons of this mineral a month.' Tantalite of the grade recovered in the Fort Victoria district has an open market value of £4,000 a ton. 'Many pegmatite bodies have also been located in the area, the geological structure of which is similar to the famous beryl and tantalite mines in Brazil,' said Mr. Welsford. 'I understand that several miles of the Mungesi River in the district have been acquired by important interests, principally for the mining of monazite. The river sands have been assayed as high as 37 per cent titanium.'

Among the rare ores which have been discovered recently in the Fort Victoria eastern districts are spodumene, fergusonite, monazite, euxenite and samarskite. The Rhodesian Iron and Steel Works are now obtaining their requirements of dolomite from properties along the Fort Victoria-Umtali main road. Several miles of high grade ore are being developed.

* * *

Net profits for the Cape Portland Cement Co., Ltd., for the year ended 30 June, amounted to £111,602, compared with £103,690 for the previous year. A final dividend of 7½ per cent makes a total of 15 per cent for the year, against 20 per cent last year. A sum of £45,000 is transferred to plant renewals and developments reserve, against £20,000 for the previous period. The balance at credit of this reserve is now £175,000, and as expenditure had been incurred in excess of this amount in the new construction programme the whole of this reserve has been transferred to the general reserve, which now stands at £280,000. Since the date of the balance sheet 14,500 shares held in the Eastern Province Cement Co., Ltd., were sold for £30,000. A sum of £30,104 was carried forward, against £26,288 brought in.

* * *

At the annual meeting of National Chemical Products, Ltd., in Germiston, recently, the chairman informed shareholders that the combined net profit of the company and its subsidiary, before providing for taxation, was £14,600 less than the profit of £169,000 earned in the previous year. In view of the fact that the company's activities were restricted because of a molasses shortage in the first six months of the year, this result is regarded as very satisfactory. The directors have recommended that the dividend on the ordinary shares be maintained at 10 per cent for the year.

* * *

In a discussion of the possibilities of establishing an electrolytic copper refinery in South Africa, the Department of Commerce and Industries points out that the annual output of sulphide ores of copper, lead and zinc, in the form of concentrates, at Tsumeb, in South-West Africa, also represents a source of approximately 28,000 tons of sulphur, which, if converted into sulphuric acid, in the further processing of these ores, could also supply a large part of the Union's requirements of sulphur. The sulphur content of the concentrates represents an annual value of approximately £250,000.

Owing to the world shortage of sulphur and the great future sulphur requirements of the uranium factories envisaged in the Union, this sulphur should meet a great deficiency in the Union's developing chemical industry. Another local mineral product, the processing of which may possibly also be successfully integrated with the activities of an electrolytic copper refinery, is the copper-nickel-platinum matte. This is produced in the Transvaal and the total annual output (all of which is now exported

overseas for refining) has a content of approximately 600 tons of scarce nickel.

* * *

Government experts who are making plans for marketing the new motor fuel to be produced at Sasolburg, in the Orange Free State, are considering schemes to transport oil by pipeline in the Union. One proposal is to pipe fuel from the oil-from-coal plant under the Vaal River to Vanderbijl Park and so avoid the difficulty caused by the inadequacy of the bridges. Another plan is to carry the pipeline all the way to Germiston or Johannesburg to relieve rail and road transport.

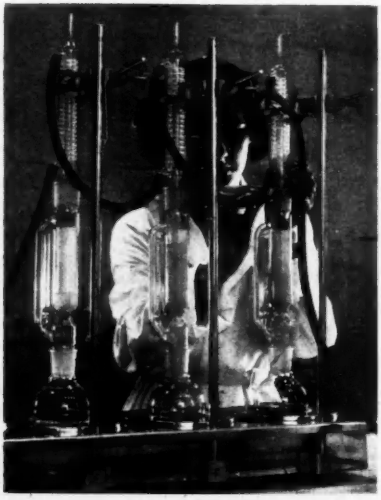
A profitable selling price was estimated at 2s. 6d. a gallon, but allowing for higher excise duty, it is believed that the State plant could undersell imported petrol at the current retail price, especially if bulk deliveries are made to the Witwatersrand by pipeline.

New Soxhlet Extractor

QUICKFIT & Quartz, Limited, have announced that their Soxhlet extractors are to be made with an improved type of siphon tube.

In this new design the conventional loop is replaced by two concentric tubes, the principal advantage being greater reliability of siphoning, particularly under limiting conditions. With the usual siphon tube, it is not uncommon for premature siphoning to take place when solvents of high surface tension are used because slugs of air are trapped in the siphon tube. On the other hand, with solvents of low surface tension siphoning sometimes fails to take place at all. These conditions can be aggravated by fast and slow rates of refluxing respectively. The new design completely overcomes these difficulties with all solvent and at refluxing speeds well above and below those required for practical purposes.

Furthermore, the new siphon not only retains the compactness which is a feature of the 'Quickfit' design of Soxhlet extractor, but is much stronger than the conventional type so that a frequent source of costly breakage is eliminated.



The improved pattern of extractor in use

USA Phosphate Rock Industry

PHOSPHATE rock produced in the United States of America in 1952 reached a record total of more than 12,000,000 long tons, according to reports by producers to the Bureau of Mines, United States Department of the Interior. In previous years, this production was recorded as mine production, while actually it was a composite of saleable products from washers and concentrators of Florida hard rock, Florida land pebble, and Tennessee brown rock; drier production of Florida soft rock (colloidal clay); mine production of Western rock plus tonnages of Florida land pebble and Tennessee brown rock ore (matrix) used directly. The actual mine production of phosphate ore (total tons of material mined) in 1952 in the United States was estimated as 328,000,000 long tons. All three areas registered increases in 1952. Total stocks in producers' hands rose 30 per cent in 1952 as compared with 1951. Phosphate rock sold or used by producers in the United States rose 2 per cent in 1952. Total value and average value were higher in 1952 than in 1951. Imports again showed an increase over the previous year, while exports were less in 1952 than in 1951. The apparent domestic consumption of phosphate rock set a new record, rising more than 5 per cent above 1951 and more than 144 per cent above 1942.

MIDLANDS SOCIETY FOR ANALYTICAL CHEMISTRY

Radio-Frequency Titration Technique

At the first meeting of the 1953-54 session of the Midlands Society for Analytical Chemistry held recently in Birmingham, Mr. L. Tarrant, of the Research Centre, Dunlop Rubber Co., Ltd., Birmingham, read a paper entitled 'Radio Frequency Titration Technique.'

Mr. Tarrant began by explaining that he intended to speak only in a general manner about radio-frequency titrations and to illustrate the scope of the method. Mr. Tarrant continued:—

It is perhaps helpful first of all to recall some of the features of the related subject of classical conductometric titration. The course of a conductometric titration is followed by plotting the volume of titrant against the conductance of the solution.

A reaction which results in the removal of ions by precipitation or complex formation causes a decrease in conductance before the equivalence point is reached, and after the equivalence point the ions due to the excess of titrant cause an increase in conductance.

There is some scope for ingenuity in selecting precipitants so as to give the smallest angle between the two arms of the titration curve. This is brought about by arranging that the anion in the titrant has a low mobility when it is the anion that is to be precipitated, and conversely that the cation has a low mobility.

Examples of this are the use of lithium chloride rather than sodium or potassium chloride for precipitating the silver ion, and barium acetate rather than barium chloride for precipitating the sulphate ion.

Polarisation Errors

If it is attempted to measure the resistance of a solution by the use of a direct current, errors are caused by the polarisation of the electrodes and the occurrence of electrolysis. To reduce this error alternating current is used, and the method of measurement is arranged so that the apparent resistance becomes equal to the true resistance.

This is brought about by minimising polarisation by (1) using large electrodes coated with platinum black and (2) using high frequencies.

However, these procedures introduce practical difficulties: platinum black sometimes has disadvantages due to its catalytic activity and adsorptive properties; and if the frequency is increased above about 1,000 c/s errors due to capacitance and inductance become appreciable.

Mention of these other electrical properties of the cell is a convenient point at which to leave the subject of low frequency conductance and to pass on to consider what happens when much higher frequencies are used as a means of detecting the end-point in a titration. Frequencies of 1 to 20 megacycles per second are usual, although still higher frequencies have been used.

Direct Contact Unnecessary

The first difference that becomes apparent is that it is no longer necessary to have direct contact between the electrodes and the solution. A cell can be made by fixing two metal plates to the outside of the walls of a glass vessel containing the solution to be titrated.

The cell is then similar to a capacitor with the solution and the walls of the vessel acting as the dielectric, and it can be incorporated in a variety of ways into the circuit of an oscillator supplying high frequency energy. Changes in the composition of the solution during a titration can then cause various electrical changes in the oscillator circuit, any of which might be used to follow the titration.

Jensen and Parrack[1] described a tuned plate-tuned grid circuit. It appears to have been this paper which caused widespread attention to be focused on radio frequency methods. The Chemical Defence Experimental Establishment at Porton has also made successful use of this type of circuit.

The two tuned circuits in this type of instrument are adjusted to resonate at approximately the same frequency. As the titration proceeds the natural resonant frequency of the plate circuit will be altered, but, within limits, oscillation will continue at a frequency intermediate between the natural resonant frequencies of the plate and grid circuits. The amplitude of the radio frequency oscillation will be reduced and

there will be changes in plate and grid currents and voltages. This circuit responds primarily to capacitive changes across the cell.

In another form of instrument a quartz crystal replaces the tuned grid circuit and after each addition of titrant a variable capacitor in the plate circuit is adjusted until the circuit oscillates. The point at which oscillation starts is abrupt and accurately reproducible, and the setting of the capacitor can be used to follow the course of the titration.

This method of using the instrument measures capacitance changes in the cell. Conductance changes can be followed by recording the maximum grid bias voltage at each point as the capacitor is varied.

Colpitt's Oscillator

Another instrument incorporates a Colpitt's oscillator, which has a single tuned circuit for the plate and the grid. Here capacitance changes across the inductance coil shift the frequency without detuning the plate circuit with respect to the grid circuit. Small capacitance changes are followed by using two such oscillators and measuring the beat frequency between them while the titration, which affects only one of them, is carried out. Changes in grid or plate currents or voltages indicate the overall conductance of the cell.

It will be realised that a variety of radio frequency titrimeters are possible, and as may be imagined, each has advantages and disadvantages. From the point of view of the analytical chemist the most usual shortcoming of any particular instrument is lack of sensitivity in a particular concentration range. The frequency-measuring instruments appear to be most useful for titrations in non-aqueous solvents.

Most of the published papers on radio frequency titrations have been concerned with instrument design, and this work has been reviewed by Jensen and Parrack,[1] West and Burkhalter,[2] and Blaedel and Malmstadt.[3]

It is important to note that it is electrical changes in the oscillator circuit that are measured and used to follow the progress of the titration. The exact relation of these changes to alteration in the composition of the solution is only now being elucidated.

An important step towards developing a theory of radio frequency titrations seems to have been the work of Hall and Gibson.[4] These authors, using standard electrical equipment (impedance measuring bridge, signal generator, etc.) devised an apparatus by which the various electrical properties of the solution itself could be isolated and measured. This was followed by a paper by Reilley and McCurdy[5] in which the authors, using the same apparatus, studied the effect on the shape of the resulting titration curve of change in the frequency, design of cell, concentration of electrolyte, and solvent.

To describe the behaviour of the cell and the solution, these authors made use of an equivalent circuit of resistors and capacitors, and were then able to derive from alternating current theory an equation for the admittance of the circuit, in terms of conductance and capacitance. (Some instruments give measurements which are nearly proportional to admittance. This is true of that described by Blake.[6])

Reilley and McCurdy divide the instruments which have appeared into three types, depending on the electrical property that is measured, the measurements being a function of the solution and the container:—

(1) Instruments whose measurements depend on high frequency conductance and which measure circuit factors such as plate, grid or cathode voltages, or currents in a tuned-circuit operating at its resonant frequency.

(2) Instruments which measure capacitance changes, e.g. the beat frequency type having two identical oscillators initially at the same frequency, the frequency of one oscillator being altered by the solution.

(3) Instruments which give a measurement dependent on both capacitance and high frequency conductance. This occurs when the quantity measured is a voltage or current influenced by a tuned circuit (containing the solution and the cell), which is not operated at its resonant frequency.

Influencing Factors

Reilley and McCurdy measured high frequency conductance, and capacitance and low frequency conductance, and studied the factors influencing these electrical properties. These factors include frequency, thickness of cell walls, area and separation of electrodes; and degree of ionisation, chemical reaction, ionic concentration and solvent differences.

Graphs were given for high frequency

conductance (μmhos) against specific conductivity (μmhos cm^{-1}) for various frequencies. The high frequency conductance is independent of the nature of the electrolyte and dependent only on the low frequency conductivity. The graphs go through a maximum and the low frequency conductance value at the peak value increases with increase in frequency. High frequency conductance is proportional to frequency at the peak.

The capacitance due to the solution can also be expressed in terms of the dielectric constant of the solvent, and it can be shown that a change in dielectric constant of solvent will also change the specific conductance value at the peak.

When the wall of the cell is thick the capacitance due to the walls of the container becomes negligibly small by comparison with the capacitance due to the solution. The frequency at the peak under these conditions is independent of other cell factors and equal to a value which can be determined solely from the dielectric constant of the solvent and the low frequency specific conductance of the solution.

Using the graphs of high frequency conductance against low frequency specific conductance, which the authors call 'transfer plots,' it is possible to relate the shape of a titration curve in which radio frequency conductance is measured to the corresponding curve of a conductometric titration.

Increasing Capacitance

Increasing the capacitance due to the walls of the container, by having larger plates or thinner cell walls, causes the peak in the transfer plot to shift in the same direction as an increase in frequency.

It is an advantage for the peak on the transfer plot to occur at a high value of k, the low frequency conductivity. Radio frequency conductance measurements then correspond to points wholly to the left of the peak on a part of the graph which is steep and nearly straight. The titration curve will not undergo inversions and the response will be sensitive and more nearly linear.

$k = \omega (C_1 + C_2)$

ω = frequency (radians per sec.)

C_1 = capacitance due to walls.

C_2 = capacitance due to solution.

A normal V-shaped high frequency conductance titration curve is obtained if the low frequency conductance changes during the titration have corresponding high frequency conductance changes which remain lower than the value at the peak. An M-shaped curve is obtained if the changes in low frequency conductance have corresponding values of high frequency conductance lying on both sides of the peak in the curve. Likewise an inverted V-shaped curve is obtained when all the low frequency conductance values during the titration have corresponding high frequency conductance values lying to the right of the peak.

In a similar way adding an inert electrolyte can alter the shape of the radio frequency conductance curve, by increasing its low frequency conductance.

Capacitance and LF Conductance

Transfer plots were also given relating the high frequency capacitance term to the specific conductance. In this case the curves do not go through a maximum. Moreover, the capacitance was found to be a unique function of the low frequency conductance, and the same curve was obtained when several different ionic species were used.

Thus, instruments which measure with high frequency capacitance should have high capacitance due to cell walls (i.e. thin cell walls) and small capacitance due to solution in order to give large changes in capacitance.

To summarise, it is apparent that the best response in a radio frequency titration can be achieved by choice of frequency, of cell design, and of solution characteristics; with a knowledge of the low frequency conductance and dielectric constant of a solution its behaviour in a high frequency titration can be accurately defined. From the point of view of the analytical chemist this means that the feasibility of employing a radio frequency titration method in a particular case cannot be judged merely by trial with a single instrument in which the frequency and cell design are fixed.

Among the numerous uses to which the titrimeter exhibited has been put are the titration of sulphate with barium, fluoride with lanthanum, fluoride with lead acetate in the presence of chloride, chloride with mercuric perchlorate and acid with alkali.

REFERENCES

[1] *Ind. Eng. Chem. (Anal.)*, **18**, 595 (1946).
[2] *Anal. Chem.* **22**, 494 (1950).
[3] *Ibid.*, **22**, 734 (1950).
[4] *Ibid.*, **23**, 966 (1951).
[5] *Ibid.*, **25**, 86 (1953).
[6] *Analyst*, **75**, 37 (1950): 'Conductometric Analysis, at Radio Frequency' (Chapman & Hall, Ltd., London 1950).

United States' Potash

Record Production of Marketable Salts

DOMESTIC production of marketable potassium salts in the United States of America reached a new record total in 1952, increasing more than 16 per cent above the 1951 production, according to reports by producers to the Bureau of Mines, US Department of the Interior. Sales and apparent consumption of potassium salts both increased in 1952, by 12 per cent and 4 per cent respectively, as compared with 1951. Stocks in producers' hands at the end of 1952, more than double the 1951 figure, were 171,807 short tons with a K_2O content of 99,061 tons.

The states of California, New Mexico, and Utah continued to supply the major portion of the domestic production of potash. New Mexico supplied more than 88 per cent of the domestic potash marketed in the US and a fifth major producer began operations in that State late in 1952.

TABLE 1

Salient statistics of the potash industry in the United States, 1950-52

		1950	1951	1952
Production of potassium salts (marketable)	short tons	2,242,647	2,474,870	2,866,462
Approximate equivalent K_2O	"	1,287,724	1,420,323	1,665,113
Sales of potassium salts by producers	"	2,221,920	2,451,913	2,757,252
Approximate equivalent K_2O	"	1,276,164	1,408,408	1,598,354
Value at plant		$39,774,447	$44,788,880	$53,754,316
Average per ton		$17.90	$18.27	$19.50
Imports of potash materials	short tons	381,490	574,361	363,898
Approximate equivalent K_2O	"	200,529	313,617*	190,862
Value		$13,993,974	$18,543,112	$13,102,739
Exports of potash materials	short tons	117,137	124,211*	101,200
Approximate equivalent K_2O†	"	65,047	68,654*	56,281
Value		$5,534,176	$7,593,646*	$4,836,659
Apparent consumption of potassium salts‡	short tons	2,486,273	2,902,063*	3,019,950
Approximate equivalent K_2O	"	1,411,646	1,653,371*	1,732,935

* Revised figure. † Estimate by Bureau of Mines. ‡ Quantity sold by producers, plus imports, minus exports.

TABLE 2

Potassium salts produced in the United States, 1950-52, *by grades, in short tons*

Grade	1950	1951	1952
Muriate of potash :			
60-62 per cent K_2O minimum*	1,846,459	2,047,793	2,468,436
48-50 per cent K_2O minimum	151,547	155,797	150,959
Manure salts	21,532	19,775	8,409
Sulphate of potash and sulphate of potash-magnesia	223,109	251,505	238,658
Total	2,242,647	2,474,870	2,866,462

* Includes refined potash and some 93-96 per cent KCl.

Both imports and exports of potash materials were less in 1952. Imports totalled 363,898 tons (190,862 tons K_2O) as compared with 574,361 tons (313,617 tons K_2O) in 1951. Import statistics in 1952 list East and West Germany separately. West Germany, East Germany, France, Spain, and Chile, respectively, supplied 32, 27, 19, 11, and 8 per cent of the total US imports of potash. Exports of potash materials totalled 101,200 tons, 19 per cent less than in 1951, with more than 97 per cent going to countries in the Western Hemisphere.

The production of higher-analysis materials continued to increase and was 86 per cent of the total potassium salts produced in the US Production of the lower grade muriate (49-50 per cent K_2O), manure salts, sulphate of potash and sulphate of potash-magnesia all decreased in 1952. The production of manure salts has dropped from 260,339 tons in 1948 to 8,409 tons in 1952.

Polythene in Canada

Production of polythene will begin within a short time at the new $3,000,000 plant of Canadian Industries, Limited, in East Edmonton. Located near Alberta's vast ethylene-producing natural gas fields, the new plant is expected to turn out about eight times the amount of polythene now available through imports from the United Kingdom and the USA. Natural gas for production will be piped from the extraction plant of Imperial Oil, Ltd., at Devon, about 15 miles southwest of Edmonton.

Maintenance Incentive

Success of Scheme at I.C.I. Fertiliser Factory

AN incentive scheme for maintenance men, based on work study, at the Ministry of Materials fertiliser factory, operated by Imperial Chemical Industries, Limited, at Prudhoe, Northumberland, has proved so successful that after the trial period on the ammonium sulphate plant was completed workers in other departments were requesting its wider application.

Formerly, 23 tradesmen were employed in the maintenance squad on this plant, but now only 10 are needed, including the estimator responsible for assessing allowed times for each job, states *Target*, the Monthly Bulletin on Productivity, produced by the Central Office of Information for the Board of Trade and the Ministry of Labour and National Service. The article continues:—

No man has been paid off as a result of these changes, the normal wastage of labour in the factory as a whole being sufficient to absorb the men displaced. Some of the men formerly employed in the ammonium sulphate plant have been transferred to other plants in the factory. The remaining tradesmen earn an average bonus of about £2 10s. each for a full week.

During the preparatory and trial periods of the scheme, appreciation courses in the principles of work study were held, attended by foremen and shop stewards from all plants.

Training of Estimator

The incentive scheme for the ammonium sulphate plant maintenance gang is based on allowed times for each job. The estimator is himself a tradesman, chosen from the maintenance gang and sent to I.C.I. divisional headquarters at Billingham for training, which includes instruction in method study, time study and dating, as well as the technique of analytical estimating.

In analytical estimating the emphasis is first of all on method, since no attempt can be made to estimate the time a job should take without a clear understanding as to what the job involves and how it is to be done. This agreed, the estimator sets out a detailed breakdown of the job into short elements. To each element he assigns a time, drawing on his experience as a tradesman and training as an estimator, and referring wherever possible to standard data.

To the total of the element times the estimator adds a rest allowance appropriate to the type of job. Standard tables are referred to, to ensure uniformity, and allowances vary from 12½ per cent for normal fitting work to as much as 50 per cent for work involving the use of respirators and cumbersome protective clothing. A further allowance is made to cover walking between jobs and washing at the end of the day.

Additional Time Allowance

Each tradesman is given a card with a brief description of the job and the time allowed for it. On completing the job he returns this card to his supervisor. Maintenance work in a heavy chemical plant is not all plain sailing, however—rust and corrosion are commonplace because of the nature of the materials used, and the estimator must bear in mind such conditions when making out his estimate. Nevertheless, unforeseen snags are bound to arise and must be met by an additional allowance of time. The responsibility is placed on the tradesman for claiming time through his supervisor, for such extra work. The supervisor is thus brought into close touch with any job which may not be going according to plan.

The nature of the maintenance work calls for a good deal of fetching and carrying, heavy lifting and so on, and normally each tradesman has an unskilled man to help him. The tradesman's estimate shows only the elements of skilled work, but a similar assessment has been made of the labourer's share in a wide range of maintenance jobs on the plant. The ratio of unskilled to skilled work so determined is used to compute the labourer's bonus.

The tradesman's bonus is calculated weekly from the total allowed time for all jobs he has done and the time taken to do them. The time taken is the time shown on his clock card for the week, less any delays or time spent working on non-bonus jobs.

The responsibility is again on the tradesman to inform his supervisor whenever he has finished a job or is held up for any

reason; failure to do so will affect his bonus earnings. The supervisor is keenly interested in eliminating all unnecessary delays because the percentage time on bonus of the gang is one of the factors that determine his own bonus earnings.

The bonus calculations are based on the following relationship:

$$\text{Performance} = \frac{\text{Total Time Allowed}}{\text{Total Time Taken}} \times 100$$

Each performance corresponds to a bonus rate per hour, payment starting at 75. All estimates are made out so that the average tradesman working at a brisk, workmanlike pace should complete the job in three-quarters of the time allowed. At this performance, i.e. 133, he will earn a bonus equal to one-third of his full tradesman's hourly rate. In order to discourage any tendency to relax standards of workmanship, a maximum earning rate is set at time and a half, and this is paid at a performance of 200. Only good work is paid for, and jobs must be carried out in a safe, satisfactory and workmanlike manner to rank for bonus payment.

Every allowed time is issued under a guarantee that it will not be altered unless the material, equipment or method of working is changed. At the same time, it is recognised that the estimates are estimates—an element of personal judgment enter into it—and some provision must be made for meeting genuine grievances when they arise. If agreement cannot be reached on the plant in such cases, the negotiating procedure for dealing with differences between the company and the unions may be invoked. More than 15,000 jobs have been done on bonus since the start of the scheme, and no dispute has not yet been settled at plant level.

The World's Sulphur

Reports from Many Countries

'ALL over the World' reads the device of the Sulphur Exploration Syndicate, and the second (September) issue of the Syndicate's quarterly Bulletin demonstrates that this is not an idle claim. The first of a series of surveys of the sulphur situation in the Commonwealth features Canada; this Dominion, immensely rich in natural resources, has unlimited amounts of sulphur contained in metal sulphides and natural oil and gas. The pulp and paper industry, however, requires large quantities of the element, which is at present obtained without difficulty from the USA, but leading consumers would prefer to be independent of external sources.

Recovered sulphur production from sour gas, although it potentially could replace, by 1955, nearly one-half of the anticipated imports, is handicapped, like the wider exploitation of pyrites deposits, by the distances between producing and consuming centres.

Canadian sulphur production in 1952 was about 400,000 tons of which about 45 per cent was exported in the form of pyrites, principally to the US, but also to the UK and the Continent. Consumption was about 550,000 tons.

A survey of sulphur developments in Mexico, particularly of the progress of work on the sulphur domes in Tehuantepec, is the second feature. The geophysical structure of the domes is feared to be less robust than that of their counterpart on the American shore of the Gulf, and only actual production in each case will show whether hopes are to be realised. If all plans are successful, 1956 should see production of over 400,000 tons, of which 300,000 tons would be exported.

In the United States, native sulphur production in the second quarter rose 6.5 per cent, but sales, partly stimulated by the impending price rise on 1 June, increased 14 per cent. By comparison with the half-year of 1952, the slight rise in total and recovered sulphur production (0.9 per cent) is dwarfed by the surge of apparent sales (9 per cent), particularly as exports have fallen by 15 per cent.

In the United Kingdom, sulphuric acid production in the second quarter was 2 per cent higher than during the first quarter; the use of pyrites rose on new plants coming into operation, whereas the use of acid sulphur declined in absolute and relative terms. Sulphur stocks continued their decline by a further 20,000 tons, and with American supplies during the third quarter meeting only about one-half of actual consumption, this trend is accentuated.

The Bulletin is obtainable from the Sulphur Exploration Syndicate, 35 Portland Place, London, W.1, the annual subscription being 10 guineas.

The Analysis of Cobalt

Part IV—Volumetric Methods*

A USEFUL volumetric method for the determination of cobalt was proposed by Cavicchi.[1] The complex ion formed between cobalt and α,α′-dipyridine, $[Co(C_{10}H_8N_2)_3]^{++}$, is stable in solution. When an excess of the dipyridine is added to a solution containing cobalt, the excess may be estimated by back-titration with 0.1N silver nitrate in the presence of 2 per cent potassium persulphate solution. The red-brown precipitate of silver dipyridine may be redissolved and the silver determined with 0.1N potassium thiocyanate. An accuracy of 0.5 per cent is shown. Nickel behaves similarly and thus interferes.

Another argentometric method was used by Jaboulay[2] for the rapid determination of cobalt in steels. The method is based on the formation of the deep yellow complex, $Co_2Na_{12}(CN)_{24}$ by addition of an alkali cyanide and an excess of sodium hydroxide to a solution of a cobalt salt. The excess cyanide is determined by titration with silver nitrate in the presence of potassium iodide and sodium sulphate. The method is as follows:—Dissolve 0.5 gm. of steel in 15-20 ml. of hydrochloric acid (1 : 1), heat, add a slight excess of nitric acid and boil. Add 100 ml. of water, boil and filter off any tungstic acid. Place the solution in a 500 ml. flask, cool, add 40 ml. of potassium cyanide solution (4.5 gm. per litre) and then 2N sodium hydroxide gradually until ferric hydroxide dissolves with difficulty. Dilute the mixture to 300 ml. and add an excess of sodium hydroxide to precipitate the ferric hydroxide in floccules. Add a further 20 ml. of 2N sodium hydroxide, shake and dilute with water to 500 ml. Filter, collect 250 ml. and titrate.

Procedure Modified Slightly

In a later paper[3] Jaboulay modified his procedure slightly, omitting the addition of nitric acid. After removal of tungsten, sodium cyanide was added and iron was removed by treatment of the solution with sodium carbonate. The filtrate was then titrated with silver nitrate to the first cloudiness. Nickel and copper interfered.

The metallic compound, $CoFe(CN)_5NO$, formed between cobalt and sodium nitroprusside, has the molar solubility 2×10^{-4}. Tomicek and Kubil[4] used the reaction in a volumetric method for the estimation of cobalt:—Place the equivalent of 10 ml. of a 0.05N solution of the metal in a 50 ml. volumetric flask and mix with 10 ml. of a 0.05N sodium nitroprusside solution. Allow to stand undisturbed for 12 hours, add enough water to make 50 ml. and centrifuge the solution for 30-60 minutes. Titrate potentiometrically the excess of nitroprusside (in the clear, supernatant solution) with 0.1N silver nitrate against a silver electrode. Addition of alcohol sharpens the potential changes during titration. Copper, cadmium and nickel can be determined by the same method.

Separation of Cobalt and Nickel

Evans[5] has proposed a method for the separation of cobalt and nickel which has proved useful in steel analysis. The cobaltocyanide ion is easily oxidised to cobalticyanide which is very stable. The nickelocyanide is not oxidised and can be destroyed, and the nickel determined by titration with potassium cyanide. In the steel determination, the cobalt is removed by double precipitation with 1-nitroso-2-naphthol in the presence of a large excess of phosphoric acid which prevents much precipitation of iron, although some is precipitated and must be removed later by addition of barium carbonate. The cobalt is finally titrated with potassium cyanide.

Tomicek *et al.*[6] found that the determination of cobalt in the presence of ammonium carbonate and potassium cyanide with ferricyanide is unsatisfactory. A satisfactory indirect method is to add excess potassium ferricyanide, protect the solution from the atmosphere, and titrate with standard cobalt sulphate solution. Zinc, cadmium and small amounts of aluminium, titanium and chromium do not interfere.

A valuable procedure for the determination of cobalt in presence of manganese has been proposed.[7] Dissolve 0.15-1 gm. of sample (the manganese content of the sample should be less than 0.1 gm.) by heating in

* Parts I, II & III were published in THE CHEMICAL AGE, 69, 77-80 ; 125-128 ; 751-752.

10-20 ml. of hydrochloric acid (d = 1.19), add 3-5 ml. of nitric acid (d = 1.4), boil to remove nitrogen oxides, evaporate until a precipitate is formed, dissolve the precipitate in water, with addition of several ml. of hydrochloric acid. If manganese is to be determined, filter the precipitate insoluble in hydrochloric acid, wash several times with hot water and decompose in a platinum crucible by adding 3-5 ml. of hydrofluoric acid and 2-3 ml. of sulphuric acid (1 : 1). Evaporate to fumes, then add several ml. of distilled water to the residue in the crucible, boil and combine the solution with the main filtrate.

Evaporate the filtrate to a small volume, cool, transfer to a 250 ml. beaker whose inner walls are covered with a thin layer of paraffin, add 2-3 gm. of ammonium chloride, and neutralise by adding ammonium hydroxide dropwise with constant stirring until ferric and aluminium hydroxides appear. Then add 15 ml. of 4N sulphuric acid, cool the solution to 8°-10° and add water to 100 ml. followed by slow addition of 6-6.5 gm. of ammonium fluoride. Titrate potentiometrically with 0.05 or 0.1N permanganate until an abrupt jump in the potential is obtained. (1 ml. of 0.1N permanganate is equal to 4.394 mg. of manganese).

Oxidation with Ferricyanide

Dissolve 10-15 gm. of ammonium chloride in the solution containing the trivalent manganese and divalent cobalt. To another 400 ml. beaker containing 140-150 ml. of 16-18 per cent ammonium hydroxide with 15 gm. of potassium citrate, add a known volume of 0.05N ferricyanide solution (a slight excess with respect to cobalt) and slowly titrate the acid solution with permanganate. Wash the beaker with 20-50 ml. of ammonium hydroxide containing 1-1.5 gm. of citrate, combine the wash liquids with the solution and titrate the excess of ferricyanide with standard cobalt solution until an abrupt change in the potential is obtained.

Determine the percentage of cobalt by the expression $(a-b) \times K \times T \times 100/w$,

where a = ml. of ferricyanide used for the oxidation of cobalt,

b = ml. of standard cobalt solution used to back-titrate the excess of ferricyanide,

K = normality coefficient of the cobalt solution,

W = weight of sample,

T = ml. of ferricyanide expressed in terms of metallic cobalt (1 ml. of 0.05N ferricyanide is equal to 2.949 mg. of cobalt).

Steel and Phelan[9] described an electrometric titration which made possible the rapid and accurate analysis of cobalt in alloys. The metals iron, nickel and chromium did not affect the accuracy. The combination electrode consisted of a saturated solution of sodium sulphate which is connected with a normal calomel cell and a platinum spiral electrode. One of the two burettes contains standard ferricyanide solution and the other a standard cobalt solution. The chemistry involved is based on the fact that cobalt salts are not oxidised by nitric and perchloric acids, but are oxidised by an ammoniacal ferricyanide solution in the presence of citrate. Consequently, an oxidimetric titration with an end-point indicated electrometrically is possible. Manganese behaves similarly and must be determined separately.

Yardley[9] has examined the potentiometric titration of cobalt with standard ferricyanide. He concluded that the cobalt should be added to the ferricyanide and should be approximately 0.05M at the start. Air should be excluded by covering the aqueous solution with petroleum ether and there should be efficient mechanical stirring.

For the determination of large quantities of cobalt, the solution may be titrated with potassium ferrocyanide until the dispersion formed coagulates. The supernatant liquid is filtered off and the excess ferrocyanide is titrated with permanganate.[10] The composition of the precipitate is given as $4CO_2Fe(CN)_6.3K_4Fe(CN)_6$.

Trivalent molybdenum solution has been used as a titrant for cobalt. The cobalt is precipitated with 1-nitroso-2-naphthol, the precipitate is dissolved in acetone, and aliquot parts of the solution are titrated with the reagent. Excess reagent is back-titrated with standard ferric solution in the presence of methylene blue as an indicator.[11]

Iodimetric Estimation

A recent paper by Pakshver and his colleagues[12] has described a simple bue elegant method for the volumetric determination of cobalt. To a divalent cobalt solution in a tall beaker are added 20 ml. of 10 per cent sodium hydroxide solution and 20 ml. of 100-volume hydrogen peroxide. After the precipitate of cobaltic peroxide has settled, the mixture is boiled for 15 minutes, cooled, 25 gm. each of potassium iodide and concentrated sulphuric acid are added, and after

a few minutes the iodine released is titrated with sodium thiosulphate as usual.

Burriel and Perez[13] have used the well-known reaction

$$HgO + H_2O + 2KCN \rightarrow Hg(CN)_2 + 2KOH$$

for the acidimetric analysis of cobalt. A neutral cobalt solution is treated with a known quantity of potassium cyanide and heated until the cobaltocyanide has been transformed into the cobalticyanide (the solution changes from green to yellow). The solution is then saturated with powdered mercuric oxide, thymolphthalein indicator added, and the solution is titrated with standard acid (1 ml. of 0.1N KCN = 2.357 mg. of cobalt).

The cobalt ammine pentammino-chlorocobaltous chloride has been shown by Gensch[14] to titrate conductometrically with sodium hydroxide. Good results are claimed.

A Simple Procedure

A simple procedure involving titration of the 8-hydroxyquinolate complex of cobalt with potassium bromate has been evolved by Tsinberg[15] for the determination of cobalt in alloys. The alloy is ignited in a platinum crucible to oxidise tungsten to the oxide. The residue is fused with fusion mixture and the leached melt is filtered. The residue is fused with fusion mixture and the leached melt is filtered. The residue is dissolved in hydrochloric acid and, after adding ammonium chloride, iron is precipitated with ammonium hydroxide. Add 3 gm. of sodium acetate to the filtrate, then acetic acid till just acid, heat to 70°, add a small excess of 2 per cent oxine in alcohol, boil, stand for 5-10 minutes, filter and titrate with standard bromate-bromide solution.

In cold solution, cobalt is precipitated with *p*-acetamido-phenylarsonic acid while nickel remains in solution. Portnov[16] recommended the following procedure for the determination of cobalt:—Mix the sample containing cobalt and nickel salts with 10 gm. of ammonium chloride and enough ammonia to make the volume 50 ml. Heat to boiling and add ammonium hydroxide to make a 0.3N solution, then add a 3-fold excess of the reagent (a 5 per cent solution). Cool and again boil for 15 minutes, cool, stand for 15 minutes and wash the filtered precipitate with 33 per cent alcohol. Dissolve in 6N hydrochloric acid at 30°-40° and determine the cobalt in the solution with bromate-bromide solution. The presence of nickel causes small positive errors.

Schwarzenbach and Bledermann[17] showed that when an excess of a neutral solution of a salt of nitrilotriacetic acid of the type $K_2(HX)$ is treated with the salt of a multivalent metal M, a complex of M and X is formed and hydrogen ions are liberated which can be titrated acidimetrically giving the amount of metal present by the shift in the titration curve from pure $K_2(HX)$. For the determination the *p*H range during which there is a sharp rise in the titration curve is 6.0-8.7.

Pribil and Malicky[18] titrated a neutral solution containing less than 30-35 mg. of cobalt per 100 ml. by adding 0.5 per cent ethylenediamine tetraacetic acid and one per cent calcium acetate. Titration was carried out with 0.1N ceric sulphate, the potential being measured two minutes after each addition for large amounts of cobalt and 4-5 minutes for small amounts. Copper, chromium, zinc, aluminium, ferric iron, magnesium and calcium did not interfere, but nickel and manganese could not be tolerated.

Pribil and Svestka[19], in further studies of complexones, determined divalent cobalt by oxidation in ethylenediamine tetraacetic acid medium with potassium dichromate in hydrochloric acid. After removal of excess dichromate with thiosulphate, the trivalent cobalt complex was estimated by potentiometric titration with chromous chloride. Iron, copper, hexavalent molybdenum, pentavalent vanadium and other oxidising agents interfered.

REFERENCES

1. *Ann. chim.*, **40**, 158 (1950).
2. *Rev. met.*, **34**, 166 (1937).
3. *ibid.*, **44**, 302 (1947).
4. *Chem. Listy.*, **31**, 471 (1937).
5. *Analyst*, **62**, 363 (1937).
6. *Collection Czechoslov. Chem. Comm.*, **14**, 20 (1949).
7. *Zavodskaya Lab.*, **11**, 1010 (1945).
8. *Gen. Elect. Rev.*, **42**, 218 (1939).
9. *Analyst*, **75**, 156 (1950).
10. *Zhur. Anal. Khim.*, **3**, 31 (1948).
11. *Zavodskaya Lab.*, **10**, 245 (1941).
12. *Zhur. Prinklad. Khim.*, **23**, 181 (1950).
13. *Anales soc. espan. fis. y quim.*, **46B**, 101 (1950).
14. *Z. anal. Chem.*, **131**, 89 (1950).
15. *Zavodskaya Lab.*, **6**, 1009 (1937).
16. *Zhur. Obshchei Khim.*, **18**, 601 (1948).
17. *Helv. Chim. Acta*, **31**, 331 (1948).
18. *Collection Czechoslov. Chem. Comm.*, **14**, 413 (1949).
19. *ibid.*, **15**, 31 (1950).

The fourth list of Amendments to Appendix A of the Report of the Departmental Committee on the Carriage of Dangerous Goods and Explosives in Ships, 1951, is now obtainable from HM Stationery Office, price 9d.

Unloading Phosphate Rock

Novel Method for Factory's First Load

THE first consignment of phosphate rock for the new Albright & Wilson phosphorus factory at Portishead, near Bristol, was unloaded at Portishead Docks recently from the 2,024-ton Panamanian ship, *Areti*, and a novel method was adopted.

The rock, which is in powder form, was unloaded by suction gear. Although grain has been coming in bulk for many years now, and experiments are being carried out with the unloading of sugar, this is the first occasion on which phosphate rock has been handled in this manner, which is much cleaner than the old methods.

The sand-like ore is unloaded by two mobile suction pumps, which can operate in either two holds or two vessels. The rock is carried by band conveyor to a bank of eight 100-ft. high storage silos, which have a capacity of 25,000 tons.

The factory, which will be the largest phosphorus producing unit in the country, will be coming into production at the end of the year. Cargoes like the *Areti's* 5,300 tons will be absorbed at the rate of one a week when the factory is working at full capacity.

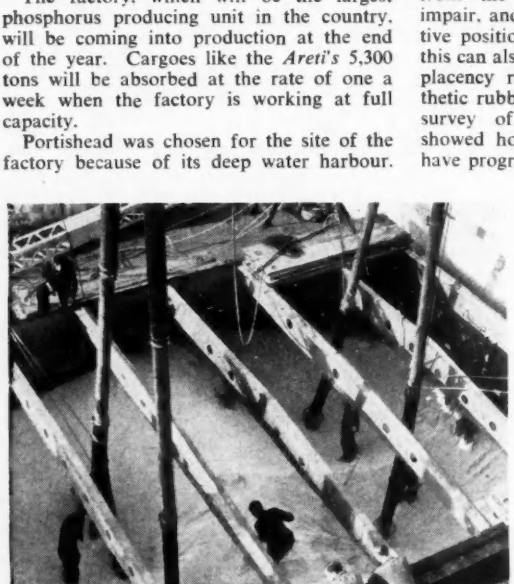
Portishead was chosen for the site of the factory because of its deep water harbour. Portishead has the second highest rise of tide in the world, and this enables ocean-going freighters to tie up at the dock and unload straight into the silos.

Synthetic Rubber's Future

GREATER availability of synthetic rubber in the United Kingdom has become a competitive necessity, according to Mr. John H. Lord, Dunlop director, who is retiring president of the Federation of British Rubber Manufacturers' Associations.

Reviewing developments during his term of office in the latter capacity, he said the intention of the United States Government to submit to Congress a plan for the disposal of their synthetic rubber plants to private industry has led to much speculation about the future supply and price of synthetic rubber.

'From all accounts,' he commented, 'the withdrawal of the American Government from the synthetic industry should not impair, and may well improve, the competitive position of the natural commodity. But this can also carry with it the danger of complacency regarding actual supplies of synthetic rubber for our industry in Britain.' A survey of synthetic rubber manufacture showed how far other industrial countries have progressed compared with this country.



Unloading by suction the first consignment of phosphate rock for the new Albright & Wilson factory at Portishead

The Chemist's Bookshelf

A SIMPLE GUIDE TO MODERN VALENCY THEORY. By G. I. Brown. Longmans, Green & Co., London. 1953. Pp. ix + 174. 12s. 6d.

Valency theory is the foundation stone of chemistry. It covers the whole discussion of potential energy and configuration for atomic, molecular, and intermolecular systems. It is the great co-ordinating principle of chemical behaviour. The nature of chemical binding forces has long been studied, but only during the present century has a chemically significant and physically acceptable theory of valence emerged. During the past thirty years it has quickly grown more and more powerful, but also more and more intricate. At frequent intervals, therefore, it is imperative that the essentials of this developing theory be formulated so that they may be appreciated by the mature non-specialist. Such a task is not easy. An even more difficult one is to present those same essentials to the comparative beginner. This latter is the task which Mr. Brown set himself. As he writes in the preface, the present book is intended to bridge the gap between the treatment of valency theory given in the standard text-books of chemistry and that given in more advanced works devoted entirely to the subject. The book does precisely this. It is clear that Mr. Brown is not only a well-informed chemist, but also a teacher of unusual skill. Those of us who have tried to cover the same ground with sixth-formers or university freshmen will be grateful to him for pointing the way.

The treatment begins with an adequate historical outline, and this is followed by a statement of the modern facts of atomic structure, with, naturally, particular reference to extra-nuclear electronic arrangements. On this foundation, separate chapters are constructed for the electrovalent, covalent, and dative bonds. In each instance the ultimate metrical basis of the subject is stressed, and the key physico-chemical methods for the diagnosis of bond type and the determination of bond properties are outlined in a clear and simple way.

In the concluding chapters, resonating molecules, the method of molecular orbitals, and the hydrogen bond are discussed at a level suitable to the occasion. Here Mr. Brown succeeds in giving an exposition fair to the topics concerned, yet free from those apparent paradoxes and ambiguities which tend to confuse and frighten the young student.

The book is well produced, and has a good index. It is worth the money.—H. MACKLE.

ESSENTIALS OF PHYSIOLOGICAL CHEMISTRY. Fourth edition. By Arthur K. Anderson. John Wiley & Sons, New York; Chapman & Hall, Ltd., London. 1953. Price 40s.

This is an elementary text-book of biochemistry, now in its fourth edition, designed for students in medicine, agriculture, and other subjects where biochemistry is perhaps not the main course followed. Its approach is chemical and stereotyped, and while recognising that this groundwork to the subject must, generation after generation, be presented to the young student, the impression is obtained that the author has insufficiently appreciated the switch of interest, from a structural to a dynamic treatment of biochemistry, which has taken place since the first edition of his book appeared in 1935.

One might suggest that the manuscript, revised with this change in view, could be freed from cerelose, viscogen, Cel-O-Glass and many other such oddities strewn here and there throughout the text, and their space used for an improved exposition of metabolites and their inter-relations; it might also permit such a blunder in the metabolic field as the identification of phosphorylase and hexokinase (p. 237) to be corrected.

An awareness of integrated enzyme action in the tissue cells, of biochemical com-

pounds, not as extractable substances giving specific colour tests, but as substrates knit into metabolism in exciting ways which are now daily being unravelled, this must be the dominant theme of any book, elementary or advanced, which claims to stimulate interest in biochemistry as a subject. Without this attitude—which the development of the subject itself demands—any text-book assumes a forlorn and rather 'old-fashioned' look. The way to make chemical compounds come alive for students is to let them be seen in action.

Unfortunately, what may be termed the 'special features' of Professor Anderson's book do not compensate for, but rather aggravate, the general inadequacy of his presentation: the intrusion of chemical tests haphazardly into a theoretical book is presumably a mistaken attempt to kill two birds with one stone, while the questions at the end of each chapter—'Define food', 'Discuss obesity', 'What is malt?'—underline what, it must be confessed, is the thoroughly unimaginative approach of this outmoded book.—F.H.M.

New Engineering Techniques

AUSTRALIAN engineers who designed equipment for a chemical plant at Rhodes, New South Wales, developed engineering techniques entirely new to the country. The plant, which was constructed for C.S.R. Chemicals Ltd., is to make cellulose acetate, and many chemicals which have previously been imported. Among the techniques in the assembly of the equipment were the casting of stainless steel welding bronze and the construction of plant to resist corrosion. The company erected a big engineering workshop specially for the work. Reactors, heat exchangers, tanks, valves and pumps, which could not be imported because of dollar shortages, were specially built. A large amount of the steel used was supplied in Australia, and some was imported from Great Britain. The engineers found an original method for welding bronze reactor vessels, the welds being subject to X-ray inspection. The company is prepared to build these vessels for Australian and overseas industries. Welding of a number of aluminium storage tanks was also carried out by use of the inert argon arc technique.

Important Agreement

Pharmaceutical Industry for Burma

AN important agreement was signed in London on Tuesday between the Government of the Union of Burma and Evans Medical Supplies, Ltd., of Liverpool. Under the terms, Evans covenant to provide the Burmese Government with scientific 'know-how' to facilitate the manufacture of a wide range of medical products and to advise on the selection of architects and consulting engineers and on the design and lay-out of a new factory to be built on a large site near Rangoon. The firm also promises to act as purchasing agent for all plant and equipment required and to provide the necessary skilled technical staff to supervise operations until such time as Burmese nationals have been trained in the United Kingdom and Burma to take over the management and control of the factory. Finally it has agreed to manage the factory for an initial period of seven years.

Over the initial seven years it is estimated that the value of the agreement to the United Kingdom, allowing for the remuneration of British technical and supervisory staff, professional fees, Evans Medical's charges, British machinery and raw materials, etc., will amount to several million pounds. As it is likely that the agreement will be extended well beyond this period it is obvious that the United Kingdom will benefit to a considerable extent. It was successfully negotiated under conditions of keen competition from continental pharmaceutical manufacturers and has the approval of the British Government.

Continental Purchases Probable

As much of the plant and machinery as possible will be bought in the UK, but the firm are honour-bound to provide the cheapest and the best and so, undoubtedly, a considerable proportion will have to be purchased from European manufacturers.

The Burmese Government have recently undertaken to provide all citizens with the medicines they require and so a tremendous increase in demand is being experienced. The first essentials to be provided by the factory include anti-toxins, sera, vaccines, a wide range of galenical products, vaccine lymph, sterile products for parenteral injection, transfusion solutions and medicinal yeast and alcohol.

HOME

Timber Preservation

A process of timber impregnation to resist dry rot and boring insects has been demonstrated in Scotland by Hickson's Timber Impregnation (G.B.), Ltd., of Castleford, Yorkshire, where development work has been carried through. Pressure impregnation at the rate of two gallons of 'Tanalith' per cubic foot of timber is claimed to give successful resistance and to maximise the life of timber used in building processes.

Sulphuric Acid Lost

Contained in the coal burnt annually in this country is sulphur corresponding to no less than 9,000,000 tons of sulphuric acid. So stated Mr. C. J. Regan, chemist-in-chief, London County Council, when he delivered the first of this season's Chadwick Lectures at the Royal Society of Arts, London, on 15 October. He described the provision of pure air as 'a Cinderella of the public health services.'

Search for Natural Gas

Following the report of the Anglo-American gas productivity team last May (THE CHEMICAL AGE, **68**, 733), the Gas Council has arranged with the D'Arcy Exploration Company to search for natural gas in Great Britain. Referring to this in London last week, Sir Harold Smith, chairman of the Council, said: 'What our success may be we cannot tell, but should we be successful the advantages accruing to our consumers might be considerable.'

Cathodic Protection

The Symposium on Cathodic Protection which the Society of Chemical Industry (Corrosion Group) is holding at the Institution of Electrical Engineers, Savoy Place, London, W.C.2, at 9.45 a.m. on 13 November, provides the first opportunity in this country for full discussion of a method which has been considerably developed during the last few years and which is likely to increase in economic importance. The list of papers shows that a serious effort has been made to produce a symposium covering a wide range of practical application and experience. Further information is obtainable from the Assistant Secretary, Society of Chemical Industry, 56 Victoria Street, London, S.W.1.

Tungsten Ores Cheaper

The Ministry of Materials reduced its selling price this week for tungsten ores of standard 65 per cent grade and ordinary quality. The reductions, which became effective on Tuesday, were as follows:—wolframite, from £15 10s. to £14; and scheelite, from £15 to £13 10s. per long ton unit delivered consumers' works.

No Uranium Pact

The Australian House of Representatives was informed last week by the Prime Minister, Mr. R. G. Menzies, that no agreement for the sale of the Commonwealth's uranium has been concluded between Britain and Australia. This statement ended speculation that a pact might have resulted from the visit to Australia of Lord Cherwell, chief atomic adviser to Sir Winston Churchill.

Tilden Lecture

The Chemical Society announces that the Tilden Lecture entitled 'Aromatic Character in Seven-membered Ring Systems' will be delivered by Dr. A. W. Johnson in the chemistry lecture theatre, Imperial College of Science & Technology, London, S.W.7, on 5 November, at 7.30 p.m.

Nutritional Reappraisals

The Nutrition Panel of the Food Group of the Society of Chemical Industry will hold its first meeting of the 1953-54 session at Burlington House, Piccadilly, London, on Wednesday next, 28 October, at 6.30 p.m. This will be the first of a new series of meetings with the general title 'Nutritional Reappraisals.' On this occasion Dr. A. E. Bender will deal with proteins.

SCI Annual Meeting

A preliminary announcement has been made by the Society of Chemical Industry that the Council has accepted the invitation of the Liverpool Section to hold the 73rd annual general meeting in Liverpool during the period 12-17 July, 1954. As hotel accommodation is somewhat limited, an effort is now being made to obtain some indication of the probable attendance at the meeting.

• OVERSEAS •

Super-phosphates from Egypt

The Egyptian authorities have approved the export of 50,000 tons of super-phosphates, the amount initially released being 25,000 tons.

Gypsum Production Declines

There was a reduction in the production of gypsum in Pakistan during the first half of this year, the total being 12,469 tons as against 13,753 tons for the corresponding period last year.

Argentine Petroleum Production

The Argentine Government is reported to be encouraging petroleum production as much as possible. It is understood that United States companies are being urged to help in the development of Argentine oil production so that the country will achieve self-sufficiency in fuel within five years.

Rubber Production Declines

Statistics just released show that during August world production of natural rubber amounted to 147,500 tons, as compared with 152,500 tons in July, and consumption fell from 117,500 tons to 112,500 tons. World consumption of synthetic rubber in August totalled 65,000 tons, which was 2,500 tons less than the July total, and production dropped 10,000 tons to 75,000 tons.

Sweden & Hydrogen Peroxide

Regulations for the imposition of an anti-dumping duty on imports of hydrogen peroxide have been issued by the Swedish Government. From investigations, it is stated, it appears that export prices quoted by several countries fall short of home-market prices in the countries concerned, the difference being as much as 60 per cent in some cases.

More Aluminium in Austria

Austrian aluminium production is expected to reach an average of 2,200 tons a month in the six months ending next March, compared with 1,750 tons a month in the corresponding period last winter. The increase is expected because more electrolysis units will be in operation at the Ranshofen aluminium works than previously. The average monthly production in the first half of this year was 3,426 tons.

More Chromite in Pakistan

During the first half of this year the production of chromite in Pakistan totalled more than 11,179 tons, as compared with 9,368 tons during the corresponding period last year.

More Titanium Required

A new $3,000,000 mine and plant to produce ilmenite, which is being constructed for the Du Pont Company near Lawtey, in north central Florida, will help the company meet the increasing demand for titanium metal and titanium pigments.

New Australian Cyclotron

A new cyclotron for atomic research work, producing a range of radioactive isotopes previously unobtainable in Australia, is planned by scientists at the University of Melbourne. With its 35-ton magnet, the new machine will cost more than £15,000.

Deep-freezing Research

Problems relating to the deep-freezing trade in Sweden will be dealt with by a special body recently established. Started in collaboration with Swedish firms and attached to the Swedish Academy of Engineering Sciences, it will function as a research and information centre.

Marketing of Tungsten & Beryllium

Under a new decree issued in Argentina, marketing of tungsten ore will be done by the Instituto Argentino de Promocion del Intercambio, but miners' co-operative societies may market the ore of their associated members direct with the IAPI's authorisation. Internal and external marketing of beryllium will be done exclusively by the IAPI.

Brazilian Resin Factory

It is reported from Sao Paulo that S.A. Geon do Brasil Industria e Commercio will begin production of vinyl resins within a year and a half, with a monthly output of 225 tons. Capitalised at Cr.$20.000,000, Geon will employ nearly 100 workers and have a capacity of 450 tons of vinyl resins a month. The factory will be installed at Sao Caetano do Sul and will use calcium carbide and chloride made by I.R.F. Matarazzo.

· PERSONAL ·

According to unofficial sources, reported as we were going to Press, the Nobel prize for medicine is to be shared by DR. HAROLD A. KREBS, Professor of Biochemistry at Sheffield University, and PROFESSOR F. A. LIPMANN, of Harvard Medical School. Born in Germany, Dr. Krebs is now a British subject. He went to Sheffield as a lecturer before the war, and was appointed to his chair in 1944. Both prize winners are leading authorities on metabolic cycles within the living cell.

One of the three gold medals awarded each year under the terms of the Hoffman Wood Trust—the Addingham Gold Medal for the outstanding contribution for the relief of pain and suffering in humanity—goes this year to DR. HAROLD KING, F.R.S., of Wimborne, Dorset, for his work on drugs producing laxness of muscles. From 1919 to 1950 Dr. King was head of the Chemical Division of the Medical Research Council. He has done important work in the elucidation of the structure of one of the bile acids. His development of relaxation drugs has eliminated the use of anaesthesia, with risk to the patient, where laxness of muscle is required by a surgeon.

MR. P. A. NEGRETTI has been appointed chairman of Negretti and Zambra, Ltd., scientific instrument manufacturers, and MR. P. N. NEGRETTI has been appointed managing director. They succeed in these posts MR. P. E. NEGRETTI, who died recently.

McGill University, Montreal, celebrated the 209th anniversary of its founder's birth recently by conferring three honorary degrees on two Canadians and one British scientist. The British scientist was SIR JAMES CHADWICK, F.R.S., Ph.D., D.Sc., master of Gonville and Caius College, Cambridge, discoverer of the neutron and a former student of one of McGill's most famous professors, Lord Rutherford. Sir James was awarded the Hughes Medal of the Royal Society in 1932 and Copley Medal in 1950. In 1935 he was Nobel Laureate in Physics and in 1951 he received the Franklin Medal of the Franklin Institute of Philadelphia.

DR. WALLACE RUBIN has succeeded DR. P. M. FISK as chief chemist of the research laboratories of Multicore Solders, Dr. Fisk having ceased his association with the company. Dr. Rubin has been associated with Multicore Solders for some time. The company is a subsidiary of Kelsey Industries.

MR. LLEWELLYN S. HOWE has joined the commercial development division of Mathieson Chemical Corporation in New York as assistant to the vice-president in charge of basic materials and facilities. Mr. Howe was formerly manager of Mathieson's hydrocarbon chemicals plant at Doe Run, Kentucky. He joined the company in 1951 as a process development engineer.

The appointment of DR. RAYMOND W. MCNAMEE as manager of research administration of Union Carbide and Carbon Corporation has been announced by DR. GEORGE O. CURME, Jr., vice-president in charge of research. Dr. McNamee will help coordinate the research activities of all the Corporation laboratories where basic research and development is being done on alloys, chemicals, gases, carbons, and plastics.

Dr. McNamee joined the Corporation's chemical research organisation at South Charleston, West Virginia, in 1933 and, since 1950, has been superintendent of the research and development department of Carbide and Carbon Chemicals Company, a Division of Union Carbide. Dr. McNamee, this year's winner of the Herty Medal of the American Chemical Society for 'outstanding contributions to chemistry in the Southeast,' has played a prominent part in the industrial research on large-scale production processes for styrene, ethylene oxide, and allethrin.

His successor, DR. FRANKLIN JOHNSTON, joined Carbide and Carbon Chemicals Company in 1933. In 1938 he was made a research group leader and, in 1951, was appointed assistant director of research for the company. As superintendent of the research and development department, he will be in charge of the company's research centre at South Charleston, West Virginia.

Publications & Announcements

ONCE again a new edition of the 'Chemical Manufacturers' Directory' has made its appearance. This useful publication has now reached its 85th edition, having first seen the light of day when Queen Victoria was on the throne. It follows the customary practice of giving a classified list of chemicals, together with the names of the makers of each kind; a list of chemical brokers and agents in London; and an alphabetical list of chemical manufacturers in England and Wales, those for Scotland and Ireland being given separately. An editorial note points out that the terms used to describe the various chemicals are in accordance with current usage and any variation is due to the firms who have supplied the data. Copies of the directory, which costs 8s. post paid, are obtainable from the 'Chemical Manufacturers' Directory,' 15, 17 and 21 City Road, London, E.C.1.

* * *

SINCE the Science Technologists' Association was formed in 1948, much progress has been made in establishing its presence and securing for it recognition in the appropriate sphere as a responsible and dignified organisation. At the same time it has not attracted as much support from senior members of the profession as had been hoped. One method of remedying this, it is felt, is to bring into being, at the appropriate time, an Institute, constituted as a company limited by guarantee, to replace the existing organisation. A memorandum on the formation of such an Institute is included in the latest issue of the Science Technologists Association Bulletin, copies of which are obtainable from the Association at the London School of Hygiene and Tropical Medicine, W.C.1.

* * *

LEICESTER, Lovell & Co., Ltd., manufacturers of 'CASCO' synthetic resin and casein glues, can now supply a range of furane resins. They claim that these resins, which are being marketed under the name 'CASCOTE,' show outstanding resistance to weak and strong acids, alkalis and solvents; and that their hard and durable surface makes them exceptionally resistant to erosion and abrasion, while resistance to high temperatures is extremely good, being surpassed (among thermosetting plastics) only by the silicones. They have, of course, the black or dark brown colour characteristic of furane resins. Particular advantages of 'CASCOTE' furane resins, assert the manufacturers, are their long storage lives, the fact that they do not suffer from the exotherm usually associated with furane resins, and their improved adhesion to metal. The range includes materials which will harden at both room and elevated temperatures. The properties detailed will have considerable appeal for such applications as chemical plant coatings, protective surface coatings, etc. Inquiries for further information and samples should be addressed to the Technical Sales Manager, Leicester, Lovell & Co., Ltd., North Baddesley, Southampton.

* * *

PERHAPS the most discussed problem of human biology at present is the apparently growing disparity between the amount of food produced in the world and the number of people to be fed. In the latest number of 'New Biology,' published by Penguin Books Ltd., Professor J. B. S. Haldane discusses the way in which the study of animal population can contribute to this discussion. Other articles include 'The Coconut,' by Dr. R. Child; 'The Origin of Biological Pattern' by Professor C. H. Waddington; 'Famous Plants—4, Chlorella,' by Dr. G. E. Fogg; and 'Famous Animals—6, The Dogfish'.

* * *

THE 'Atomic Scientists' News,' organ of the Atomic Scientists' Association, has been renamed the 'Atomic Scientists' Journal,' beginning with the September issue, Vol. 3, No. 1, since it was felt that the old name might be taken as indicating that the journal contained items of information of interest only to atomic scientists. Although the cover has been re-designed, the nature of the contents remains unchanged; articles include 'Fundamental Particles' by Dr. P. E. Hodgson, and 'Life at Chalk River' by Mrs. Freda Kinsey. Associate members—those without a specialised knowledge of atomic physics, but who are in sympathy with the aims of the Association—receive the journal and other publications free on payment of an annual subscription of one guinea. Details are obtainable from Professor J. Rotblat, Physics Department, St. Bartholomew's Hospital, London, E.C.1.

Do you want 5-50 Gallons of Distilled Water per DAY ?

PERMUTIT
Portable
DEMINROLIT
will give it to you

Here is the modern equivalent of distilled water, produced by 'Deminrolit' at a fraction of the cost of distillation. No heat or steam required. Operated by ion exchange, producing water free from dissolved solids.

Send for Technical Publication No. 62 giving full details.

The **PERMUTIT Company Ltd.**

Dept. V.A.154, Permutit House, Gunnersbury Avenue, London, W.4. Telephone: CHiswick 6431

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

Satisfactions

INFRA RED DEVELOPMENT CO., LTD., Welwyn Garden City, manufacturers of scientific appliances. Satisfactions, 22 September, of debentures registered 22 February, 13 June and 10 December, 1951.

ENGLISH CLAYS LOVERING POCHIN & CO., LTD., St. Austell. Satisfaction, 17 September, of charge registered 16 May, 1934, to the extent of £10,000.

Change of Name

The following change of name has been announced: H. BENNETT (PHARMACY), LTD., to GORDON SMITH (CHEMISTS), LTD., on 22 September, 1953.

New Registrations

J. D. McDermott, Ltd.

Private company. (524,451.) Capital £3,000. Wholesale, retail and manufacturing chemists, druggists, etc. Directors: J. D. McDermott, Mrs. C. E. McDermott. Reg. office: 1 Raynor Road, Fallings Park, Wolverhampton.

Deodor-X Hygiene Services (Tyneside), Ltd.

Private company. (524,441.) Capital £5,000. Sellers of hygiene or other fumigating and disinfecting products and to render services in connection therewith, etc. Directors: H. F. G. Sheppard, J. H. Chandler, F. L. Coventry, R. F. Heron and F. H. Dale. Reg. office: 309 Corporation Road, Birkenhead, Cheshire.

Durazone (Sales), Ltd.

Private company. (524,448.) Capital £100. Manufacturers of, agents for and dealers in cleaning preparations, soap and washing materials, detergents, etc. Subscribers: W. Rajbenbach, H. Teper. First directors are to be appointed by the subscribers. Reg. office: 16 Manchester Square, W.1.

Company News

African Explosives

The offer to the preference shareholders of African Explosives and Chemical Industries Ltd., of £3,000,000 4½ per cent guaranteed loan stock 1968/73 at par has been subscribed over two-and-a-half times. It has accordingly been necessary to scale down the allotments, but all applicants will receive an allotment. Letters of allotment were posted a few days ago. The offer was announced on 26 September 1953.

Bryant & May Limited

An interim dividend of 6 per cent on the ordinary stock and an interim of 5 per cent on the partnership stock, both free of tax, have been declared by Bryant & May Limited (controlled by the British Match Corporation) in respect of the year ending 31 March next. The company has paid similar interim dividends since and including the 1948-49 financial year, followed each time by final dividends of 10 per cent and 5 per cent, tax free, respectively.

Thos. W. Ward Limited

At the 50th annual general meeting of Thos. W. Ward Limited, to be held on 20 November, the directors will recommend a final dividend of 15 per cent less tax, on the ordinary share capital, making, with the interim dividend of 5 per cent, less tax, already paid, 20 per cent less tax, for the year ended 30 June. In addition it is proposed to pay a bonus of 2½ per cent on the ordinary and employees shares, out of capital profits, not subject to income tax, to mark the 75th anniversary of the founding of the business and the 50th annual general meeting. Dividend warrants will be posted on 20 November. A Jubilee bonus will also be paid to the company's staff and workpeople.

A GREAT RANGE—

Hedge Brown or Small Skipper, Peacock, Orange Tip or Painted Lady . . . each of the butterflies in Nature's great range that eventually flirts with the suns of summer, owes its safe arrival to a superb piece of container construction called a chrysalis. And though we at Reads have never contracted to construct a chrysalis, we have had marked success with many other successful containers in the last 84 years.

So much so, in fact, that our standard range now includes almost every type of container in common use, from a half-ounce tin to a fifty-gallon drum—and our development staff is solving new problems, adding new lines, every day. If *you* are planning to introduce new lines, or to re-introduce old ones in more attractive forms, the long experience of Reads of Liverpool is at your service.

READS
OF LIVERPOOL

READS LIMITED

ORRELL HOUSE, ORRELL LANE, WALTON, LIVERPOOL, 9 · Phone: Aintree 3600
London Office: Grand Buildings, Trafalgar Square, W.C.2 · Phone: TRAfalgar 5781
Also at Glasgow, Belfast and Cork

R 1351-C

Next Week's Events

MONDAY 26 OCTOBER

The Chemical Society

Cardiff: University College, 5.30 p.m. R. P. Bell: 'Methods of Measuring Reaction Velocities in Solution.'

Institute of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. E. J. G. Bailey (I.C.I.): 'Recent Developments in PVC.'

Institute of Works Managers

Glasgow: 39 Elmbank Crescent, C.2, 7.15 p.m. L. Langdon Goodman: 'Electronics in Materials Handling.'

TUESDAY 27 OCTOBER

Royal Institute of Chemistry

Leeds: The University, 6.30 p.m. Dr. R. C. Tincknell: 'Krilium Soil Conditioner—Improving Soil Structures.'

Institute of Physics

Newcastle-on-Tyne: King's College, 6.15 p.m. Professor A. M. Taylor: 'Photoelectric Methods for the Measurement of Polarised Light.'

Society of Instrument Technology

London: Manson House, Portland Place, W.1, 6.30 p.m. A. R. Aikman, J. McMillan, A. W. Morrison: 'Static and Dynamic Performance of Sheathed Industrial Thermometers.'

WEDNESDAY 28 OCTOBER

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Nutrition Panel. Dr. A. E. Bender: 'Nutritional Reappraisal — Proteins.'

Institution of Chemical Engineers

Coryton, Essex: Vacuum Oil Refinery. Visit by Graduates' and Students' Section.

Manchester Literary & Philosophical Society

Manchester: 57 Mosley Street, 6 p.m. Chemical Section discussion: 'The Training of Chemists.'

Manchester Metallurgical Society

Manchester: Central Library, 6.30 p.m. L. N. W. Pursey: 'Production of High-purity Zinc.'

THURSDAY 29 OCTOBER

Royal Institute of Chemistry

Brighton: Technical College, 7 p.m. Joint meeting with SCI (London Section) and College Chemical Society. Dr. A. G. Maddock: 'Developments of Experimental Techniques in Radiochemistry.'

The Chemical Society

Nottingham: The University, 4.45 p.m. Joint meeting with University Chemical Society. Professor E. R. H. Jones: 'Allene Chemistry.'

Sheffield: The University, 7.30 p.m. Joint meeting with University Chemical Society. Professor Wilson Baker: 'Structure, Stereochemistry and Inclusion Compounds of Some Phenol Derivatives.'

Society of Chemical Industry

Belfast: Queen's University, 7.45 p.m. E. D. Hughes: 'The Comparative Chemistry of Carbon and Silicon.'

Institute of Fuel

Nottingham: Gas Showrooms, 6.15 p.m. W. C. Moss: 'The Ridley Report, the CUC and the Public.'

FRIDAY 30 OCTOBER

Royal Institute of Chemistry

Manchester: Town Hall, 7 p.m. Eighth Dalton Lecture. Sir John Cockcroft: 'The Development of Radiochemistry and Radiation Chemistry.'

The Chemical Society

Cambridge: The University, 8.30 p.m. Joint meeting with University Chemical Society. Professor G. Gee: 'The Polymerisation of Sulphur.'

Institute of Metal Finishing

Sheffield: Grand Hotel, 6.30 p.m. J. Pigott: 'The Plater on His Mettle.'

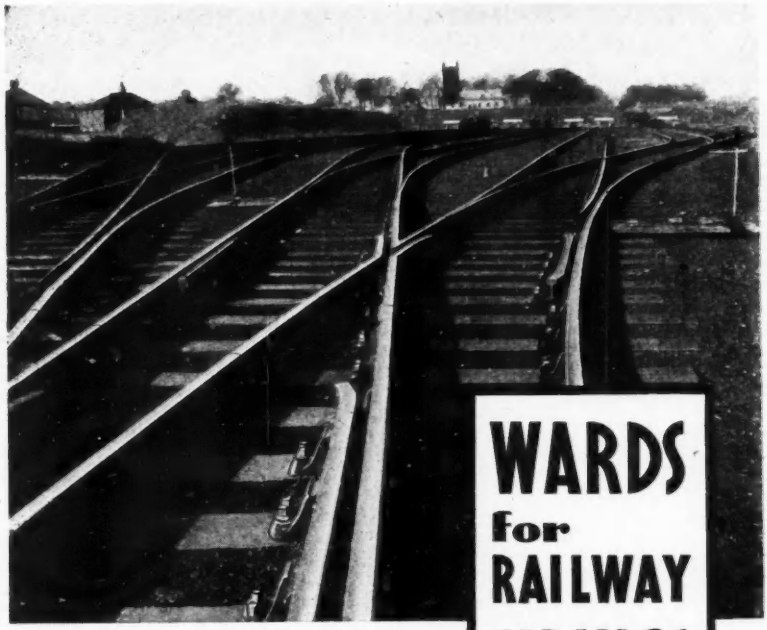
SATURDAY 31 OCTOBER

Society of Chemical Industry

Plymouth: Technical College, 2.30 p.m. Joint meeting of SW Section with RIC and CS. Symposium: 'Chemist and Administrator.'

Society of Leather Trades Chemists Ltd.

Manchester: College of Technology, 2 p.m. D. Burton and J. E. Bickley: 'The Natural Acidity in Vegetable Tanning Liquors'; A. L. Smith: 'Tannery Installations.'



WARDS For RAILWAY SIDINGS

IN the planning and construction of railway sidings, Wards offer a high degree of technical skill and experience. Wards have been building sidings for nearly half a century and thus bring to the subject an extensive knowledge of a variety of operating conditions. Similarly, in the supply of railway equipment generally, Wards Rail Department service covers new and re-usable rails of all normal sections, as well as switches, crossings, turnouts, buffer stops, etc. Associated supplies include colliery arches, pit props, roofing bars, floor plates, and, of course, all manner of track accessories and tools.

In short, Wards have a comprehensive service on every aspect of railway siding planning, construction and maintenance for industrial operation.

The layout illustrated above shows a ladder of sidings at the Primrose Hill Unit of the National Coal Board, by whose courtesy the photograph is reproduced.

ANOTHER ASPECT OF TWW SERVICE

The Railway Siding Consultants and Contractors

THOS W. WARD LTD

ALBION WORKS · SHEFFIELD

TELEPHONE: 26311 (22 Lines) · TELEGRAMS "FORWARD, SHEFFIELD"

LONDON OFFICE: BRETTENHAM HOUSE · LANCASTER PLACE · STRAND · W.C.2

SC/23

The London Potters

Association Celebrates Centenary

CENTURIES-OLD links between the London Thames-side potters of the first Elizabethan era and the vast present-day British ceramic industry were recalled at a luncheon held at the Savoy Hotel last week to celebrate the centenary of the London Potters' Association.

Lambeth and Southwark delftware, Fulham salt-glaze stoneware, and Bow and Chelsea china are among the many contributions of London to British ceramic history, the influence of which can never be overrated. John Dwight, 'father of English ceramics,' who founded the famous Fulham Pottery in 1671, brought the art of pottery-making to a degree of excellence previously unattained in this country. In 1815, John Doulton, who served his apprenticeship under Dwight's grandson, established a two-kiln pottery in Lambeth, and from this sprang the world-famous Royal Doulton Potteries.

The first meeting of the London Potters' Association was held at the Bridge House Tavern, Southwark, on 23 September, 1853. At the luncheon last week, a terra-cotta bust of the chairman, Mr. L. J. E. Hooper, a great-grandson of one of the founding members of the Association, was presented on behalf of the National Federation of General Stoneware Manufacturers by Mr. I. Winston Cheavin, governing director of the Fulham Pottery.

Synthetic Textiles

THERE is not enough money in the world to build synthetic textile plants capable of an output to hurt the traditional fibres. Mr. A. J. Quig, deputy chairman of Imperial Chemical Industries Ltd., said this when addressing Grangemouth and District Chamber of Commerce recently. He said that despite the concern in certain quarters there was not the slightest prospect of newer fibres, such as nylon and Terylene, damaging the demand for wool, cotton and rayon. Wool output was in the region of 1,000,000 tons a year, cotton 8,000,000, and rayon around 2,000,000 tons, so there was little likelihood that all the nylon and Terylene produceable anywhere could make a dent in the market.

Market Reports

LONDON.—The call for industrial chemicals from the chief consuming industries on the home market during the past week has been steady but there is once again an alteration in the price of dry red lead and litharge and dry white lead, the basis prices now being dry red lead and litharge £124 per ton and dry white lead £142 per ton, as from 20 October. On the export market there is still a fairly strong demand for phenol. The reduction of duty on hydrocarbon oils has not yet had a definite effect on prices on the coal tar products market, and there is no special feature to report, trading being much the same as in the past few weeks.

MANCHESTER.—In most sections of the Manchester chemical market during the past week steady trading conditions have been reported, especially in the wide range of products for the textile bleaching, dyeing and finishing trades. Home-trade users of alkalies and of the potash and ammonia compounds have been calling for steady deliveries. On the export side, a moderate weight of new business in the leading heavies has been arranged. Values generally are well held. In the fertiliser section, the top grades of basic slag continue to meet with an active demand and a gradual increase in buying interest has been reported in most other directions.

GLASGOW.—A satisfactory week's trading has once again been reported from all sections of the trade due to the sustained demand for the usual run of chemicals from the textile, paint and other consuming industries.

South African Phosphate

When the South African State-assisted phosphate undertaking, Foskor, starts production about the middle of next year, it will, it is now stated, be able to supply the whole of the Union's phosphate requirements. Bigger deposits of rock phosphate have been found than expected. It is estimated that about 700 tons of phosphate a day will be produced at first. It is expected that this will later be doubled and eventually quadrupled.

J.M.S

FOR DELIVERY FROM STOCK

ORTHOTOLUIDINE
PARA FORMALDEHYDE
FORMAMIDE
ADIPIC ACID
BLANC FIXE
ANHYD. SOD. SULPHATE
POTASSIUM CHLORATE
SODIUM ACETATE

Write Dept. B/35 for Samples.

J. M. STEEL & CO. LTD.
36/38 KINGSWAY, LONDON, W.C.2. Tel: HOLborn 2532/5
Branch Offices:
51 SOUTH KING ST., MANCHESTER 2 (Tel: Deansgate 6077/9)
45 NEWHALL ST., BIRMINGHAM 3 (Tel: Central 6342/3)

KC

A PERFECTLY BALANCED PRODUCT...

in a balanced container
is the *Seal of Efficiency*

Brough's DRUMS

LIVERPOOL 8 & SPEKE
Telephones: Royal 3031-3 • Hunts Cross 2071 • Telegrams: "Superdrum"
London Office: Regent 3665

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS in various Government Departments. The Civil Service Commissioners invite applications for pensionable posts. Applications may be accepted up to December 31st, 1953, but an earlier closing date may be announced either for the competition as a whole or in one or more subjects.

The posts are divided between the following main groups and subjects :—(*a*) Mathematical and Physical Sciences ; (*b*) Chemistry and Metallurgy ; (*c*) Biological Sciences ; (*d*) Engineering subjects ; and (*e*) Miscellaneous (including e.g., Geology, Library and Technical Information Services).

AGE LIMITS. For Experimental Officers, at least 26 and under 31 on December 31st, 1953 ; for Assistant Experimental Officers at least 18 and under 28 on December 31st, 1953. Extension for regular service in H.M. Forces.

Candidates must have at least one of a number of specified qualifications. Examples are Higher School Certificate, General Certificate of Education, Scottish Leaving Certificate, Scottish Universities Preliminary Examination, Northern Ireland Senior Certificate (all in appropriate subjects and at appropriate levels), Higher National Certificate, University degree. Candidates taking their examinations in 1953 may be admitted. Candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. In general a higher standard of qualification will be looked for in the older candidates than in the younger ones.

Inclusive London salary scales :—

Experimental Officer £681-£838 (men) ; £586-£707 (women).

Assistant Experimental Officer £274-£607 (men) ; £274-£511 (women).

Starting pay according to age up to 26. At 18, £274 ; at 26, £495 (men) ; £467 (women). Somewhat lower in provinces.

Further particulars and application forms from **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S94-95/53. Completed application forms should be returned as soon as possible.

21283/176/EH/a.

LARGE CHEMICAL WORKS in Home Counties require young, active men, who have completed their National Service commitments, to train for **SHIFT SUPERVISOR** work in the factory. Minimum standard required is General Certificate or equivalent in Chemistry, Mathematics and English. Salary according to age, qualifications and experience. Canteen facilities. Pension scheme. **APPLY BOX No. C.A. 3271, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

LONDON MERCHANTS seek highly qualified Chemical and Pharmaceutical Departmental Manager conversant with international trading conditions, Eastern and barter business. Good profit participation, permanent position. Apply **SECRETARY, J. C. GILBERT, LTD., COLUMBIA HOUSE, ALDWYCH, W.C.2.**

FOR SALE

CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating ; also lumps ground and granulated; established 1830 ; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS : "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.**

600

ELEVATORS AND CONVEYORS

INCLINED Static **SLAT AND CHAIN CONVEYOR,** 37-ft. centres. Timber slats, 16 in. by 5 in. by 1½ in., on 6-in. pitch roller chain. Loading height, 2 ft. ; discharge height, 16 ft., approx. Motorised 400/3/50.

Chain and Bucket **ELEVATOR.** Vertical. Split steel cased. 88-ft. centres approx. Double chain carrying buckets 12 in. by 9½ in. by 8½ in., spaced 2 ft. 9 in. Pulley drive through reduction gear.

30-ft. Horizontal **SCREW CONVEYOR** by Spencer (Melksham), Ltd., with 15-in. diam. by 12-in. pitch worm in square trough. Trough fitted five 15 in. by 12 in. discharge ports and four sets breeches chutes with Butterfly valves.

Single **CHAIN AND BUCKET ELEVATOR,** by Johnson. Totally enclosed. 26-ft. centres. Pressed buckets, 7½ in. by 5 in. by 4 in., spaced 16 in. Pulley drive through spur gearing. Discharge chute approx. 10 ft. 6 in. long.

Chain and Bucket **ELEVATOR.** Split Steel cased. Approx. 35-ft. centres. Double chain carrying buckets 12 in. by 7 in. by 5 in. Pulley drive through reduction gear, discharging to short worm conveyor, thence to enclosed steel hopper 8 ft. square at top by 5 ft. on straight, with 5 ft. 6 in. deep cone, 12 in. sq. discharge.

Two Inclined Continuous **BUCKET ELEVATORS.** Open type. Approx. 25 ft. centres. Single chain carrying buckets 18 in. by 10 in. by 10 in. Belt driven through reduction gear. Each discharge to inverted pyramid-type hopper, 4 ft. 6 in. sq. at top, 3 ft. deep on straight, with 3 ft. 4 in. conical portion, fitted vizor-type discharge.

GEORGE COHEN SONS & CO., LTD.,
WOOD LANE, LONDON, W.12.
Tel. : Shepherds Bush 2070, and
STANNINGLEY, NR. LEEDS.
Tel. : Pudsey 2241.

ONE TORRANCE MICRO TWIN-ROLLER MILL. Cast rolls, 14 in. by 8 in. Water cooled. Fast and loose pulley-drive.

TWO **DE LAVAL SEPARATORS, VEE-BELT DRIVE.** Good condition.

THOMPSON & SON (MILLWALL), LIMITED, CUBA STREET, LONDON, E.14. TEL. EAST 1844.

WORTHINGTON-SIMPSON 2½ in. by 3 in. **VACUUM PUMP,** coupled to twin station can air testing bench, for sale. Motor, 400/440/3/50. Bench, 52½ in. by 24⅝ in. Treadle-controlled valve.

ALLEY & MACLELLAN A.C.I. **VACUUM PUMP,** for maintaining 24-in. vacuum. Vertical type, water cooled. Displacement, 150 cu. ft. air per minute. With filter, unloader and pressure gauge reading 80 p.s.i.

F. J. EDWARDS, LTD., 359, EUSTON ROAD, LONDON, N.W.1. EUSton 4681.

FOR SALE

C. BARBER, LTD.

C.I. **FILTER PRESS,** 25½ in. square, by **MANLOVE ALLIOTT,** plate and frame type, 13 chambers, arranged for washing. Excellent condition.
TWO HYDRO EXTRACTORS, 72 in., by **BROADBENT.** (One new and unused.)
TWO "HORMANN" 30 cm. Stainless Steel FILTER PRESSES.
STORAGE BINS in stainless steel, cylindrical, with covers. 40/12/14/10 gallons capacity.
CANNON STEAM-JACKETED ENAMEL-LINED PANS, 10 and 25 gallons. All new and unused.
DOULTON 25-gallon **COPPERS** with lids. **NEW** and unused.
WELDED VESSELS of all types, in mild steel or stainless. Fabricated to customer's specifications.

C. BARBER LTD.
SILVERDALE GARDENS
HAYES MIDDLESEX
Telephone—Hayes 2735/6

PORTABLE SLAT LOADING CONVEYOR, 24 ft. centres, 19½ in. wide, adjustable from 2 ft. 6 in. to 16 ft. 6 in., driven by new 2 h.p. petrol engine.
12 brand new jacketed **STERILIZING VESSELS,** 7 ft. long by 3 ft. diam., complete with fittings.
3 excellent **VACUUM OVENS,** complete with vacuum pumps, trays and belongings.
2—18 in. **KEK PLATE MILLS,** complete with feeders delivery bins, motors and entablature.
9 Worssam **ROTARY PRESSES.**
POWDER DRESSING or **SIFTING MACHINES,** various sizes.
4 Recessed plate **FILTER PRESSES,** 30 in. square, 70 plates in each, centre fed.
2 Johnson **FILTER PRESSES,** 24 in. square, side feed and enclosed delivery, fitted 29 plates and 30 frames.
1 Johnson **FILTER PRESS,** 36 in. square, plate and frame type, double inlet and enclosed delivery ports.
1 Johnson **FILTER PRESS,** 42 cast iron plates, 32 in. square, centre feed.
1 Johnson **FILTER PRESS,** 47 plates, 32 in. square, centre feed, bottom corner open delivery.
Wood **FILTER PRESS,** fitted 69 ribbed plates, 2 ft. 8 in. square, with top centre feed and bottom enclosed delivery channel.
24 in., 30 in. and 36 in. **HYDRO EXTRACTORS,** self-balancing, swan-neck type, self-emptying bottom, belt and motor driven.
Heavy cake **CRUSHING MILL,** 2-pair high, by Nicholson, for cake up to 3 in. thick, rolls 30 in. long, top with coarse teeth 9 in. diam. bottom with finer teeth 12 in. diam.
5 sets of A.A. **CRUSHING ROLLS** for linseed, cottonseed, etc., 48 in. long, belt driven, with feed hopper, side frames, baseplate and striking gear.
Bennett Copper-built **EVAPORATOR,** 4 ft. diam. by 4 ft. 6 in. high, steam jacketed bottom, mounted on legs, with swan-neck vapour pipe and separate vertical belt driven vacuum pump.
"U" shaped horizontal jacketed **MIXER,** 7 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven.
3—5 roll **REFINERS,** fitted chilled iron, water-cooled rolls, 40 in. long, 16 in. diam. belt and gear driven, with clutch drive suitable for motor, by Baker Perkins, Ltd.
1 No. 1A water-cooled **CIRCULATOR MILL.**

RICHARD SIZER, LTD.,
ENGINEERS,
HULL.
Telephone 31743.

FOR SALE. JOHNSON PLATE & FRAME FILTER PRESS, HARD RUBBER COVERED THROUGHOUT. 17 in. sq. cakes, 14 frames; side feed and side discharge; hand screw closing. Price £375. **BOX No. C.A. 3278, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

FOR SALE

MORTON, SON & WARD LIMITED
— offer —
JACKETED PANS in s.s. or m.s. with or without mixing gear.
MIXERS, horizontal or vertical, jacketed or unjacketed to requirements. Several in stock.
TROUGH MIXER by **CHALMERS,** 3 cwt., s.s. lined tilting trough.
2 **TROUGH MIXERS** by **GARDNER,** 3 cwt., s.s. lined troughs.
"MORWARD" "U"-shaped TROUGH MIXERS in any size up to 3 tons.
ONE 500 gallon **JACKETED AUTOCLAVE** with detachable cover, 150 lb. in jacket.
500, 300 and 200 gallon **AUTOCLAVES** in m.s. riveted construction with detachable covers.
HYDRO EXTRACTORS in stock from 72 in. to 36 in. by **BROADBENT** and 42 in. by **WATSON LAIDLAW.** all electric, thoroughly re-conditioned complete with starters and guaranteed.
PUMPS—A large selection in stock, 2 in. to 6 in, new and s.h.

ENQUIRIES INVITED
MORTON, SON AND WARD LIMITED,
WALK MILL,
DOBCROSS, NR. OLDHAM,
Lanes.
'Phone: Saddleworth 437

WANTED

CASH Buyers all grades of Non-Ferrous Metal Scrap. Residues. Send details—**D. HARRIS, 28 GEARY ROAD, DOLLIS HILL, LONDON, N.W.10.**

FENNERS FASHIONS
are open to purchase
FREEHOLD OR LONG LEASEHOLD PROPERTIES
up to £20,000.
Write in confidence to
MR. JACEY
409, NORTH END ROAD, LONDON, S.W.6.

SERVICING

CRUSHING, GRINDING, MIXING and DRYING for the trade.
THE CRACK PULVERISING MILLS LTD.
Plantation House,
Mincing Lane,
London E.C.2.

GRINDING, CRUSHING AND GRADING
FINE GRINDING LTD.,
BLACKHOLE MINE, EYAM
TELEPHONE: EYAM 227

WET AND DRY GRINDING, Micronising, Grading and Mixing of Minerals and Chemicals for all trades. Also suppliers of ground zircon, sillimanite, fused silica, precision casting materials and a wide range of ground minerals.

W. PODMORE & SONS, LTD.,
SHELTON, STOKE-ON-TRENT.
Phones STOKE-ON-TRENT 2814 & 5475

SERVICING

PULVERISING of every description of chemical and other materials for the trade with improved mills, wharfage, and storage facilities. THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers, Valuers and Fire Loss Assessors of CHEMICAL WORKS, PLANT AND MACHINERY
York House, 12 York Street, Manchester.

Telephone 1937 (2 lines) Central Manchester

For Classified Advertising
THE CHEMICAL AGE

Gives direct and immediate penetration. Is the recognised liaison between buyer and seller.

Accepts advertisements up to first post on Tuesday for insertion in that week's issue.

Gives a reduced rate for more than three insertions and

PULLS IN RESULTS

The rates are 4d. per word (approx. 7 words to a line) or 25/- per inch semi-displayed.

Send your classified advertisements for Invitations to Tender, Situations Wanted and Vacant, Articles for Sale, and Miscellaneous Requirements to :—

THE CHEMICAL AGE
BOUVERIE HOUSE, FLEET STREET, LONDON, E.C.4

Telephone: Central 3212 (26 lines)

Decolorising **CARBON**

ALL GRADES FOR ALL TRADES

HIGHEST EFFICIENCY
LOWEST PRICES

Granular Carbon for Solvent Recovery.
Regeneration of Spent Carbon.

Write for samples and quotations.

FARNELL CARBONS LIMITED
CONDUIT ROAD, PLUMSTEAD, LONDON, S.E.18
Telephone: Woolwich 1158 (2 lines). *Telegrams:* Scofar, Wool, London

Mirvale

MIRVALE

Cresylic Acid

CRESOLS, PHENOL
HIGH BOILING TAR ACIDS
CRESYLIC CREOSOTE
NAPHTHALINE, PYRIDINE

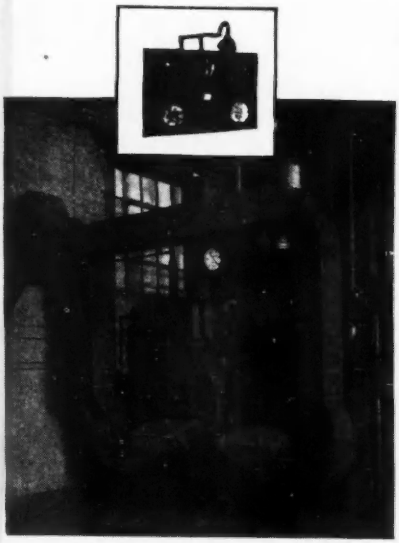
MIRVALE CHEMICAL CO. LIMITED
MIRFIELD, YORKS. Phone Mirfield 2157

PITCH PINE

A wide range of sizes and qualities of this traditional timber are available. A specialised staff deliver a variety of specifications to all trades with continuity from ample stocks.

●

MALLINSON & ECKERSLEY, LTD.
(ROBERT BIBBY, F.C.A., Receiver and Manager)
BROWN ST. (OFF WORSLEY ST.), SALFORD 3, LANCS.
'Phone: BLACKFRIARS 1474-7 'Grams: BAYWOOD MANCHESTER



Wilton complete combustion saves fuel

10% MORE STEAM–5% LESS FUEL

Easy to install, the Wilton Fan Draught Furnace ensures complete combustion from the lowest grade fuels. The immediate saving of over 5 per cent in fuel quickly repays the initial conversion cost. Full boiler output is economically maintained and complete control under all circumstances assured Write now for descriptive brochure of our Underground, Unit or Overhead systems.

Northern Office : T. G. Fegan, M.Inst.F. Cannonfield, Hathersage, Nr. Sheffield Phone : Hathersage 333.

Chemical Engineering
Wiltons Ltd

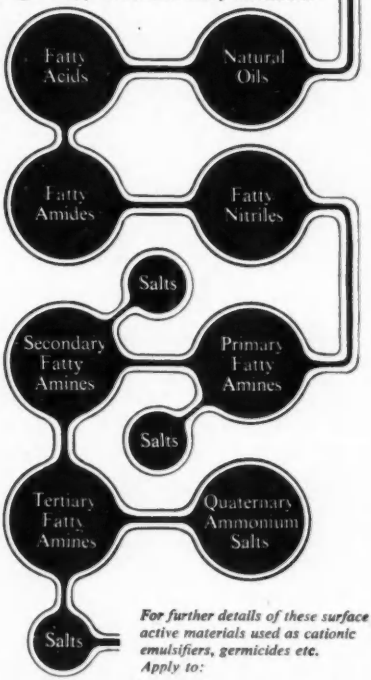
SIMON ENGINEERING GROUP

HOLBROOK PARK, HORSHAM, SUSSEX.
Telephone : Horsham 965.
Telegrams : Evaporator, Phone, Horsham.

W 26

Now in full supply

Guest Industrials Ltd. can now offer full supplies of high quality fatty Alkyl Amines, Amides and Nitriles of chain lengths C8 to C18, and Quaternary Ammonium Compounds. These are top-quality chemicals manufactured by Liljeholmens Stearinfabriks A.B., Stockholm, and have an ever growing range of applications in many industries.



For further details of these surface active materials used as cationic emulsifiers, germicides etc. Apply to:

GUEST INDUSTRIALS LTD.

Raw Materials Division

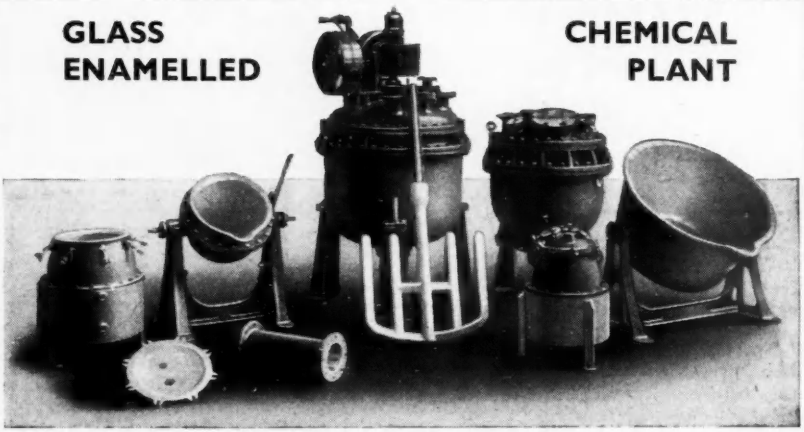
81, GRACECHURCH STREET, LONDON, E.C.3.
Telephone: Mansion House 5631 (16 lines). Telegrams: Guestind, London. Sub-Agents in Scotland: H. M. Roemmele & Co. Ltd., 65, West Regent Street, Glasgow, C.2.

A. Harris and G I Dixon Company

INDEX TO ADVERTISERS IN THIS ISSUE

	Page
A.P.V. Co., Ltd. (The)	Front Cover
Baker Perkins, Ltd.	844
Braby, Fredk., & Co., Ltd.	842
British Acheson Electrodes, Ltd.	839
British Electrical Development Association	843
British Oxygen Co., Ltd. (The)	836
Brotherhood, Peter, Ltd.	831
Brough, E. A., & Co., Ltd.	885
Browns Foundry Co., Ltd.	Cover Two
Callow Rock Lime Co., Ltd. (The)	Cover Three
Chemical Engineering Wiltons Ltd.	889
Civitas Trading Corporation, Ltd.	833
Clark, T. & C., & Co., Ltd.	890
Classified Advertisements	886, 887, 888
Farnell Carbons, Ltd.	888
Geigy Co., Ltd. (The)	834
Guest Industrials, Ltd.	Cover Two, 889
Imperial Smelting Corporation (Sales), Ltd.	Back Cover
Jobling, James A., & Co., Ltd.	835
Kestner Evap. & Engineering Co., Ltd.	838
Lennox Foundry Co., Ltd.	840
Mallinson & Eckersley, Ltd.	888
Mirvale Chemical Co., Ltd.	888
National Enamels, Ltd.	Cover Three
Nordac, Ltd.	846
Permutit Co., Ltd. (The)	879
Pott, Cassels & Williamson	842
Powell Duffryn Carbon Products, Ltd.	837
Pulsometer Engineering Co., Ltd.	846
Quickfit & Quartz, Ltd.	841
Reads, Ltd.	881
Spencer Chapman & Messel, Ltd.	838
Staveley Iron & Chemical Co., Ltd. (The)	840
Steel, J. M., & Co., Ltd.	885
Ward, Thos. W., Ltd.	883
Whitaker, B., & Sons, Ltd.	Cover Two
Wilkinson Rubber Linatex, Ltd.	832
Yorkshire Tar Distillers, Ltd.	Cover Three

GLASS ENAMELLED CHEMICAL PLANT



Capacities from 1 to 1000 gall. to suit your requirements.

T. & C. CLARK & CO. LTD.

Telegrams: Clark, Wolverhampton · WOLVERHAMPTON · Telephone: 20204/5

Drying Trays

- IN HARD RESISTANT VITREOUS ENAMEL
- SPECIALLY PROCESSED TO GIVE MAXIMUM SERVICE
- ALL CORNERS AND EDGES ROUNDED
- SIZES TO SUIT CUSTOMERS REQUIREMENTS
- FINISHED IN GREEN OR OTHER SELECTED COLOUR

NATIONAL ENAMELS LTD.
53, NORMAN ROAD, GREENWICH
LONDON, S.E.10.
Telephone: Greenwich 2266-7 and 2429

CALLOW ROCK
Gas-Burnt
LIME
for all purposes
• • •
QUICKLIME
(Calcium Oxide)
of the highest commercial quality, in lumps or in coarse powder form
HYDRATED LIME
(Calcium Hydroxide)
in Standard and Superfine grades to meet most industrial requirements
• • •
The Callow Rock Lime Co. Ltd.
CHEDDAR, Somerset
Agents: DURHAM RAW MATERIALS, LTD., 1-4, Great Tower Street, LONDON, E.C.3.

PURE
ALPHA PICOLINE
BETA PICOLINE
GAMMA PICOLINE
2:6 LUTIDINE
YORKSHIRE TAR DISTILLERS LTD
CLECKHEATON, YORKS.
TEL. CLECKHEATON 790 (5 LINES)
YTD
TELEGRAMS TO- YOTAR CLECKHEATON

FLUORINE COMPOUNDS—

INCREASING USE IN INDUSTRY

ANHYDROUS HYDROFLUORIC ACID

HYDROFLUORIC ACID · BORON TRIFLUORIDE

BENZOTRIFLUORIDE · FLUOSULPHONIC ACID

Now that the technical difficulties encountered in the manufacture of Fluorine compounds have been overcome, new fields of chemistry can be explored. Fluorine-containing refrigerants, plastics, insecticides and intermediates all show great industrial promise. The above-mentioned compounds are of value in the manufacture of such fluorinated materials, and are available in commercial quantities. Our research department would be pleased to advise on any technical queries regarding the use of Fluorine compounds.

IMPERIAL SMELTING

U.K. MEMBER OF THE CONSOLIDATED ZINC CORPORATION LIMITED

A PIONEER IN THIS CHEMICAL FIELD

IMPERIAL SMELTING CORPORATION (SALES) LIMITED · 37 DOVER ST · LONDON · W.1

Printed in Great Britain by THE PRESS AT COOMBELANDS Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 24 October 1953. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.

r 1953

RY

ES

ACID

RIDE

ACID

ure of
y can
es and
tioned
erials,
rtment
use of

D

· W 1

OTHERS
Office.